Evaluation of the Contribution of Chinook Salmon Reared at Columbia River Hatcheries to the Pacific Salmon Fisheries

Annual Report FY 1985

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ABSTRACT

FY 1985 was the seventh year of an eight-year study to determine the distribution, contribution, and value of artificially propagated fall chinook on the Columbia River. Tagging of hatchery fall chinook was completed in FY81. Sampling of sport and commercial marine fisheries from Alaska through California, Columbia River fisheries, and Columbia River hatcheries and adjacent streams occurred in 1985 as planned. Catches and returns of two brood years tagged (1980-1981) could have occurred in 1985.

Returns of fall chinook to Columbia River facilities as of September 30, 1985 are 85,222. This return is already larger than three of the past five years. Several facilities (Big Creek, Cowlitz, Priest Rapids and Willamette Falls) are having the greatest returns since inception of the study. However, Spring Creek and Little White Salmon hatcheries are having the smallest return.

Estimated Catches of coded wire tagged salmonids are available through 1983 for all fisheries except Alaska in 1981 and Washington in 1983. Catch proportions by fishery for the 1978 brood are .01, .41, .34, .07, 0, and .17 for the Alaska, Canada, Washington, Oregon, California, and Columbia River fisheries respectively. The proportion of recoveries for the four age groups of 1978-brood fish caught are .05, .63, .30, .01 for the two-through five-year-old chinook respectively. Catches by hatchery differed from the average considerably. For USFWS and ODFW facilities the three-year-old catch predominated and for the WDF facilities the four-year-old catch is dominant.

Contributions to the fisheries per 1,000 fish released for all hatcheries combined are 2.7 and 3.6 for the 1978 and 1979 broods respectively. Four years (1980-1983) are included in the contribution values for the 1978 brood and three years (1981-1983) for the 1979 brood. Spring Creek Hatchery has the greatest contribution to the fisheries of 8.3 and 12.8 fish per 1,000 fish released for the 1978 and 1979 broods respectively. The Spring Creek contribution is followed by Stayton Pond, Abernathy, Bonneville and Big Creek at 6.5, 4.2, 2.9 and 2.6 respectively for the 1978 brood and Big Creek, Stayton Pond and Abernathy at 8.4, 6.7 and 4.7 respectively for the 1979 brood. Other facilities have contributions per 1,000 releases of approximately 2 or less. These contributions are minimums since all possible fisheries and catch years are not yet included.

STUDY GOALS AND OBJECTIVES

In 1979 the Bonneville Power Administration (BPA) began funding an 8-year study to determine the distribution, contribution, and value of fall chinook salmon raised at Columbia River rearing facilities. Information from this tagging study will provide data to determine the effectiveness of hatcheries constructed as mitigation for hydroelectric developments. In addition, this data will aid fishery agencies in planning further measures to protect, mitigate, and enhance salmon runs on the Columbia River. This information is important to regulating bodies, such as the Pacific Fishery Management Council, charged with negotiating, setting, and adjusting fishing seasons, locations, and limits. Current regulations are based on data from a fin-marking study completed over ten years ago. Since completion of that study, new rearing facilities have been built, existing facilities renovated, alterations in sport and commercial fisheries have occurred, and hatchery practices have changed.

The objectives of the study are to: 1) determine the contribution of fall chinook from Columbia River hatcheries to individual Pacific salmon fisheries by age class of fish, and 2) determine the distribution, contribution, and value of each hatchery's production of fall chinook to Pacific coast salmon fisheries.

The desired goal to achieve objective 1 was to tag a constant percentage of fish at each rearing facility. A goal of tagging at least 150,000 fish at each facility was set to achieve objective 2. We have attempted to meet both goals at each hatchery. This required additional tag codes at some hatcheries because the number of fish tagged for the constant percentage was insufficient to meet the 150,000 goal. This report briefly describes tagging, release and recovery activities during the first seven years of the study and details activities and preliminary results during FY 1985.

STUDY DESCRIPTION

The National Marine Fisheries Service (NMFS) is coordinating the study among three fisheries agencies: U.S. Fish and Wildlife Service (USFWS), Oregon Department of Fish and Wildlife (ODFW), and Washington Department of Fisheries (WDF).

Tagging

From 18 to 20 facilities rearing fall chinook on the Columbia River were included in this study each year (Figure 1). Personnel from the participating agencies tagged a portion of the fall chinook production at most Columbia River facilities rearing fall chinook. The fish at each facility received a distinctive mark consisting of an adipose fin clip and insertion of a unique coded wire tag in the snout. From 2.5 to 5 percent of the production at each facility was randomly selected for tagging. Sampling devices developed by WDF and NMFS were used to select the fish for tagging.

Figure 1. - COLUMBIA RIVER FACILITIES PARTICIPATING IN THE FALL CHINOOK STUDY

ODFW and USFWS personnel used a mobile tagging unit constructed by NMFS with BPA funds to tag fish at their facilities. WDF used their own tagging equipment. During the four brood years, 1978 through 1981, nearly 15 million fall chinook were tagged. The numbers tagged each year were 4,379,300, 3,009,900, 3,660,500, and 3,651,300.

Except for the 1978-brood fall chinook at ODFW and USFWS facilities, tagged fish were returned to the populations of untagged fish from which they came.

Prerelease Sampling

During the tagging operation at each facility, tagging supervisors randomly removed a minimum of 2,000 tagged fish. These fish were held separately and were examined at the time of the facility's production release to determine tag retention at release. Just prior to release, fall chinook populations at most participating facilities were sampled to determine the tagged to untagged ratios. In many cases these ratios were used to determine the numbers of tagged and untagged fish released.

Releases

Nearly 14 million tagged fall chinook were released from the participating facilities during the four brood years. Releases were 4,035,100, 2,864,700, 3,466,400, and 3,475,500 for the 1978 through 1981 brood years, respectively. The percentage of the releases tagged each year was 4.4, 3.5, 3.9, and 4.1 for the four broods, respectively. Total releases ranged from 81 million to 92 million from the participating facilities (Tables l-4).

Downstream Migration

Research personnel from NMFS' Northwest and Alaska Fisheries Center sampled the Columbia River estuary and marine waters near the mouth of the Columbia during the migration time of the four broods of fall chinook. The purposes of this sampling were to: 1) define migrational characteristics of marked salmonid stocks from release site through the estuary, 2) provide data to assist in evaluating different hatchery production techniques within a release year, and 3) determine juvenile survival to the estuary for selected stocks and compare this survival with fishery contribution and hatchery returns of these stocks. The usefulness of this sampling for evaluating hatchery techniques and determining potential fishery contribution and survival ranges for fall chinook will not be fully evident until the final catch and return data are compiled.

Sport and Commercial Fishery Recoveries

Sport and commercial fisheries from Alaska through California are being sampled for wire tagged salmonids (Figure 2). Recoveries of the 1978-brood began in 1980. Fishery recoveries of the 1981 brood will not be complete until 1986 (Table 5).

TABLE 1. -- Releases of 1978-brood fall chinook salmon from Columbia River facilities in 1979.

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	63,400	05-04-50	15,000	80.2	830,600	909,000	95	4/17 - 5/18
	48,900	05-04-51	11,600	80.2	640,700	701,200	61	4/17 - 5/18
BIG CREEK	224,900	07-18-44	26,400	89.5	4,996,000	5,247,300	81	5/21
BIG WHITE POND	141,400	05-04-43	3,200	97.8	2,884,100	3,028,700	69	5/21
BONNEVILLE	287,900	07-18-42	5,500	98.1	12,262,400	12,555,800	75	5/ 1 - 5/29
	15,100	07-18-43	200	98.7	824,000	839,300	80	5/21
COWLITZ	143,600	63-19-42	2,500	98.3	4,478,800	4,624,900	85	6/27 - 10/16
	11,100	63-19-51	0	100.0	0	11,100	85	6/27 - 10/16
ELOKOMIN	21,100	63-18-56	0	100.0	0	21,100	99	6/15
	117,800	63-19-56	5,800	95.3	2,730,700	2,854,300	99	6/15
GRAYS RIVER	73,900	63-16-46	2,600	100.0	1,220,800	1,297,300	92	6/ 9 - 6/12
	7,600	63-18-33	0	100.0	0	7,600	92	6/ 9 - 6/12
	68,100	63-19-37	0	98.3	0	68,100	92	6/ 9 - 6/12
KALAMA FALLS	214,500	63-19-57	3,300	98.5	3,940,300	4,158,100	177	6/22 - 7/13
KLASKANINE	244,100	07-18-45	28,600	89.5	5,218,100	5,490,800	71	5/29
KLICKITAT	225,400	63-19-49	3,700	98.4	3,366,400	3,595,500	80	5/14 - 6/13
LITTLE WHITE SALMON	177,800	05-04-48	8,900	95.2	5,655,500	5,842,200	111	6/22
	264,800	05-04-49	12,700	95.4	5,291,100	5,568,600	111	6/22
PRIEST RAPIDS	48,100	63-18-21	2,000	96.0	776,400	826,500	74	5/23
	17,500	63-18-57	700	100.0	267,700	285,900	77	6/28
	5,300	63-19-58	0	100.0	0	5,300	77	6/28
	82,200	63-20-17	0	99.2	0	82,200	77	6/28
SEA RESOURCES	24,200	63-19-18	300	98.6	957,500	982,000	112	5/ 1 - 5/31
SPEELYAI	51,700	63-19-20	400	99.2	0	52,100	28	9/ 5
	104,500	63-19-50	3,500	96.8	78,500	186,500	86	7/19
SPRING CREEK	148,900	05-04-33	13,600	91.2	3,568,600	3,723,100	54	5/18
	135,500	05-04-44	19,400	87.5	4,357,400	4,512,300	87	4/20
	55,600	05-04-45	6,300	89.9	1,141,600	1,203,500	19	8/13
	246,000	05-04-46	13,000	95.0	9,861,000	10,120,000	125	3/20
STAYTON POND	283,800	07-18-41	9,400	96.8	4,398,800	4,692,000	67	5/ 7 - 5/21
TOUTLE	12,000	63-18-54	0	100.0	0	12,000	160	6/17
	132,100	63-19-41	6,000	96.0	2,619,500	2,757,600	160	6/17
WASHOUGAL	97,400	63-19-38	8,300	100.0	4,826,800	4,932,500	78	6/14 - 9/ 2
	154,500	63-19-46	0	96.8	0	154,500	78	6/14 - 9/ 2
WEYCO POND	92,400	63-19-39	2,500	97.4	271,600	366,500	58	6/ 5
Total	4,035,100		215,400		87,464,900	91,715,400		

TABLE 2. -- Releases of 1979-brood fall chinook salmon from Columbia River facilities in 1980.

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	35,200	05-06-44	1,100	96.9	466,500	502,800	59	4/ 9 - 5/14
	112,500	05-06-46	2,400	97.9	1,360,000	1,474,900	59	4/ 9 - 5/14
BIG CREEK	143,400	07-21-60	2,200	98.5	6,287,900	6,433,500	78	5/13
BONNEVILLE	121,100	07-21-57	4,400	96.5	4,947,400	5,072,900	74	5/20 - 5/28
COWLITZ	20,700	63-21-37	200	99.7	543,400	564,300	9	3/21 - 4/ 1
	244,300	63-21-54	9,900	96.1	5,671,800	5,926,000	129	6/ 3 - 7/11
	70,500	63-21-59	2,900	96.1	1,566,600	1,640,000	119	6/18 - 7/11
ELOKOMIN	98,400	63-20-05	2,100	97.9	2,310,600	2,411,100	80	6/19
GRAYS RIVER	37,500	63-20-43	1,500	96.2	768,000	807,000	85	6/ 1 - 6/24
KALAMA FALLS	100,400	63-21-05	1,500	98.5	2,299,000	2,400,900	124	6/13 - 6/24
KLASKANINE	66,300	07-21-61	900	98.7	2,170,500	2,237,700	79	6/ 4
KLICKITAT	156,100	63-19-47	1,600	99.0	2,981,700	3,139,400	85	5/27
LEWIS RIVER	103,700	63-21-60	1,800	98.3	321,700	427,200	117	7/15
LITTLE WHITE SALMON	162,600	05-06-43	1,900	98.9	8,611,500	8,776,000	101	6/10
LOWER KALAMA	144,500	63-20-06	5,800	96.2	3,129,500	3,279,800	150	6/10
OXBOW	49,400	07-21-62	900	98.3	1,115,200	1,165,500	100	5/27
	51,900	07-21-63	900	98.3	1,170,100	1,222,900	100	5/27
PRIEST RAPIDS	110,100	63-19-48	700	99.7	2,272,900	2,383,700	69	5/20 - 6/24
RINGOLD POND	37,100	63-19-48	0	100.0	631,700	668,800	88	6/26
SEA RESOURCES	1,900	63-19-47	0	100.0	0	1,900	90	5/28
	18,400	63-20-61	400	98.1	745,400	764,200	90	5/28
SPRING CREEK	125,500	05-06-39	4,700	96.4	7,209,900	7,340,100	123	3/10
	75,200	05-06-40	2,500	96.8	3,836,300	3,914,000	83	4/10
	60,500	05-06-41	1,300	97.9	3,128,900	3,190,700	51	5/ 9
	23,100	05-06-42	500	98.2	1,088,900	1,112,500	19	8/ 7
STAYTON POND	282,800	07-20-55	3,400	98.7	6,063,200	6,348,600	87	4/28 - 5/21
WASHOUGAL	314,600	63-21-53	7,500	97.7	5,771,800	6,093,900	99	6/30
WEYCO POND	97,800	H1-02-03	3,600	96.5	1,850,500	1,951,900	90	6/10
Total	2,864,700		66,600		78,320,900	81,252,200		

TABLE 3. -- Releases of 1980-brood fall chinook salmon from Columbia River facilities in 1981.

Rearing Facility	Tagged Fish Released	Tag Code	Ad Only Fish Released	% Tag Retention	Unmarked Fish Released	Total	Fish/lb	Release Dates
ABERNATHY	19,100	05-07-44	3,300	85.4	278,000	300,400	69	4/15 - 5/26
	63,500	05-07-45	10,600	85.7	826,700	900,800	69	4/15 - 5/26
BIG CREEK	50,200	07-23-31	1,500	97.1	1,856,000	1,907,700	77	5/ 7 - 5/18
	51,100	07-23-33	1,600	97.0	1,888,600	1,941,300	77	5/ 7 - 5/18
	46,000	07-23-34	1,400	97.0	1,698,100	1,745,500	77	5/ 7 - 5/18
BONNEVILLE	130,000	07-21-56	4,800	96.5	5,007,400	5,142,200	73	4/24
	75,700	07-23-29	2,700	96.6	3,113,000	3,191,400	68	5/12
CLATSOP COUNTY PONDS	73,200	07-21-58	900	98.8	1,726,800	1,800,900	75	5/15
	48,900	07-21-59	300	99.3	1,308,500	1,357,700	70	5/22
COWLITZ	153,200	63-21-56	7,400	95.4	3,121,300	3,281,900	86	6/27 - 6/28
	121,300	63-22-55	2,200	98.2	2,773,400	2,896,900	77	6/12 - 6/28
ELOKOMIN	156,200	63-22-34	4,000	97.7	2,755,400	2,915,600	102	6/ 1
	9,400	63-23-17	0	100.0	0	9,400	100	6/ 1
GRAYS RIVER	64,100	63-22-63	800	99.0	1,145,700	1,210,600	85	6/ 1 - 6/ 8
	10,200	63-23-40	0	100.0	0	10,200	93	6/ 1
KALAMA FALLS	175,400	63-20-36	3,200	98.2	3,432,800	3,611,400	103	5/22 - 5/28
KLASKANINE	18,900	07-22-27	500	97.5	718,000	737,400	86	5/18
	82,100	07-23-32	2,100	97.5	3,121,800	3,206,000	86	5/18
KLICKITAT	130,000	63-20-08	2,700	98.0	2,346,500	2,479,200	78	6/ 5
LITTLE WHITE SALMON	183,400	05-07-47	4,700	97.5	6,587,300	6,775,400	94	6/ 4 - 6/ 5
	52,400	05-08-49	1,400	97.4	1,883,300	1,937,100	94	6/ 4 - 6/ 5
	13,300	05-08-50	600	95.6	489,200	503,100	94	6/ 4 - 6/ 5
LOWER KALAMA	155,300	63-22-54	6,500	96.0	2,836,900	2,998,700	98	6/ 1 - 6/10
PRIEST RAPIDS	194,600	63-21-55	1,500	99.3	3,793,200	3,989,300	89	6/23 - 6/24
	42,100	63-22-61	100	99.7	787,900	830,100	67	5/18
SEA RESOURCES	43,300	63-22-01	1,100	97.4	786,800	831,200	90	4/16 - 4/29
SPRING CREEK	104,700	05-07-40	400	99.6	4,743,200	4,848,300	90	3/25
	76,700	05-07-41	800	99.0	3,117,800	3,195,300	71	4/15
	63,100	05-07-42	300	99.5	3,141,500	3,204,900	65	5/ 5
	25,700	05-07-43	100	99.5	123,900	149,700	75	4/21 - 4/22
	150,500	05-07-46	800	99.5	724,700	876,000	75	4/21 - 4/22
	28,800	05-07-48	100	99.5	1,345,400	1,374,300	118	3/25
	30,900	05-07-49	300	99.0	1,255,000	1,286,200	71	4/15
	13,700	05-07-50	0	100.0	635,200	648,900	121	3/25
	15,400	05-07-51	100	99.5	748,000	763,500	102	3/25
	7,200	05-07-52	200	97.8	283,600	291,000	15	8/12
STAYTON POND	245,500	07-23-35	7,500	97.0	5,649,700	5,902,700	75	4/27 - 6/15
WASHOUGAL	28,700	63-21-48	300	99.1	483,200	512,200	35	7/ 6 - 9/ 4
	278,800	63-22-51	3,100	98.9	5,228,000	5,509,900	74	6/30 - 7/ 6
WEYCO POND	169,500	H1-03-01	2,700	98.4	3,328,100	3,500,300	90	5/15 - 6/12
	64,300	H1-03-02	600	99.0	1,208,100	1,273,000	90	5/15 - 6/12
Total	3,466,400		83,200		86,298,000	89,847,600		

TABLE 4 -- Releases of 1981 brood fall chinook salmon from Columbia River facilities in 1982

Rearing Facility	Tagged Fish Released	Tag Code	Untagged Fish Released	Retention	Released	Total	Fish/lb	Release Dates
ABERNATHY	90,600	05-10-58	7,100	93 0	994,500	1,092,200	51	4/20 - 6/ 1
	29,800	05-10-59	2,900	91 0	331,400	364,100	51	4/20 - 6/ 1
BIG CREEK	131,200	07-24-10	4,300	96 8	4,400,800	4,536,300	75	5/17
BONNEVILLE	105,900	07-24-07	700	99 3	1,086,100	1,192,700	80	4/23
	96,800	07-24-08	1,500	98 4	2,095,500	2,193,800	80	5/21 - 6/ 4
	102,400	07-26-63	2,000	98 1	2,724,500	2,828,900	92	4/14 - 4/20
CLATSOP COUNTY PONDS	79,700	07-24-12	1,100	98 6	1,838,100	1,918,900	80	5/28
	33,900	07-24-13	500	98 6	788,000	822,400	80	5/28
COWLITZ	41,300	63-20-32	0	95 4	0	41,300	90	6/24 - 7/ 8
	8,300	63-24-50	100	98 8	151,600	160,000	28	9/29
	199,200	63-24-62	4,500	98 7	6,691,300	6,895,000	90	6/24 - 7/ 8
	47,500	63-26-03	900	98 1	795,600	844,000	30	9/29
ELOKOMIN	52,200	63-22-42	1,000	98 1	1,246,900	1,300,100	80	6/15
	50,600	63-22-60	2,000	96 2	1,247,400	1,300,000	80	6/15
GRAYS RIVER	27,500	63-24-58	1,100	96 2	279,400	308,000	87	6/ 1
	45,400	63 24-59	1,600	96 6	471,400	518,400	87	6/ 1
KALAMA FALLS	177,100	63-24-60	600	99 7	3,375,200	3,552,900	102	6/10 - 7/ 2
KLASKANINE	100,300	07-24-09	1,000	98 8	1,927,000	2,028,300	85	6/ 7
KLICKITAT	204,100	63-21-57	2,000	99 0	3,473,600	3,679,700	83	6/ 4
LITTLE WHITE SALMON	101,300	05-04-35	1,500	98 5	3,933,100	4,035,900	93	6/ 2 - 6/ 3
	98,500	05-04-36	1,800	98 2	3,902,400	4,002,700	93	6/ 2 - 6/ 3
LOWER KALAMA	139,400	63-24-63	1,600	98 3	3,027,000	3,168,000	117	6/13 - 6/25
OXBOW	52,300	07-23-30	700	98 6	2,083,800	2,136,800	78	6/ 4 - 6/25
	52,500	07-24-11	700	98 6	2,092,200	2,145,400	78	6/ 4 - 6/25
PRIEST RAPIDS	262,200	63-22-52	800	99 7	4,360,300	4,623,300	87	5/24 - 6/16
	48,700	63-24-56	900	98 2	836,400	886,000	67	5/18
SEA RESOURCES	45,000	63-24-57	2,500	94 8	783,100	830,600	100	4/ 1 - 5/ 7
SPRING CREEK	500	05-07-53	25	95 0	46,300	46,825	17	7/30
	400	05-07-54	25	95 0	46,300	46,725	17	7/30
	46,700	05-08-51	1,200	97 5	258,400	306,300	79	4/ 8 - 4/13
	151,400	05-10-50	3,600	97 7	7,045,400	7,200,400	110	3/25 - 3/26
	38,900	05-10-51	1,000	97 5	2,130,200	2,170,100	78	4/15
	58,300	05-10-52	5,300	91 6	2,927,700	2,991,300	48	5/20
	102,300	05-10-57	2,600	97 5	567,100	672,000	79	4/ 8 - 4/13
STAYTON POND	265,800	07-26-62	11,300	95 9	6,473,700	6,750,800	88	5/ 3 - 5/21
WASHOUGAL	170,400	63-24-61	4,400	97 5	3,321,100	3,495,900	90	6/30 7/ 6
WEYCO POND	217,100	H1-04-06	7,600	96 6	4,270,700	4,495,400	100	6/18
Total	3,475,500		82,450		82,023,500	85,581,450		

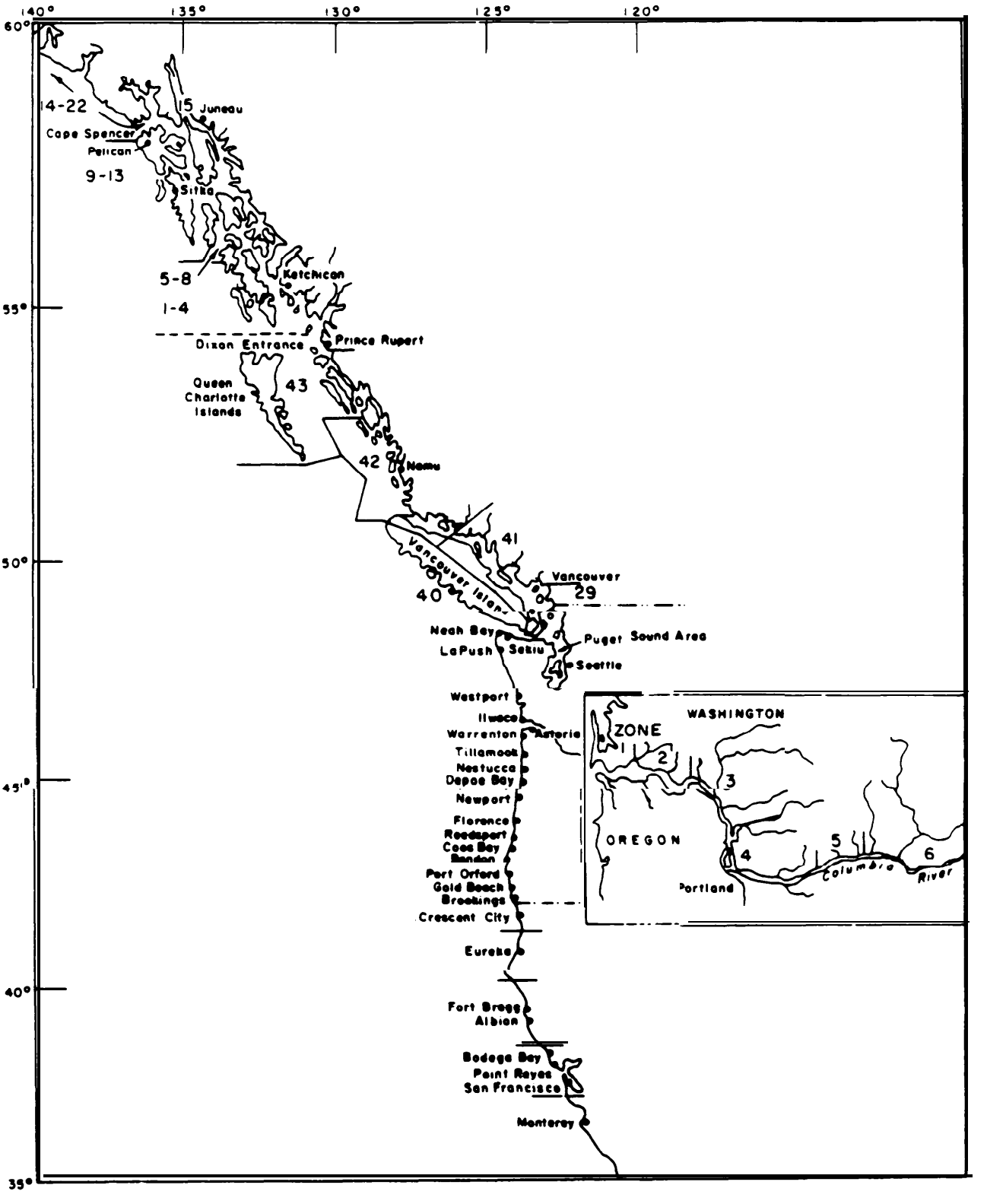

Figure 2. Ports and zones sampled for marked fall chinook salmon of Columbia River origin.

Table 5. Recovery years of the 1978- through 1981 -brood fall chinook from Columbia River hatcheries.

	Calendar Year						
Brood Year	1980	1981	1982	1983	1984	1985	1986
1978	X	X	X	X			
1979		X	X	X	X		
1980			X	X	X	X	
1981				X	X	X	X

Hatchery Returns

Personnel from WDF, ODFW, and USFWS examine all returning fall chinook for the absence of fins. Biological data are collected from untagged returns at a predetermined systematic sampling rate. Samplers remove the snout of all fish with a missing adipose fin. The biological data will be used to estimate the ages of untagged fish. The age structure for tagged and untagged fish will be compared to determine if tagging changes the age distribution of returning adults.

Data Analysis

The factors to be examined at the completion of the study are summarized in Table 6. Analysis of some factors may be limited to simply noting an occurrence. Many of the factors are intertwined (confounded). This may prevent a direct cause and effect relationship. For example, there are no quantitative measures for disease history. It is not possible to make a comparison between groups of fish where group A is known to be X percent healthier than group B. The best that can be done is to note group A had such and such diseases and group B had none. Thus the diseases in group A would be a likely reason for lower survival (assuming there was lower survival). However, the confounding of the factors of disease, rearing environment, time and size of release, stock, hatchery, etc., may prevent determining a direct relationship between survival and any one factor.

RESULTS AND DISCUSSION

Tagging of fall chinook for this project was completed in 1982. Fisher) and hatchery sampling occurred in 1985 as planned.

Fishers Recoveries

Final estimated recoveries of tagged fall chinook are available for 1980 through 1983 for most major salmon fisheries on the Pacific coast. The Pacific Marine Fisheries Commission publishes the data for the United States fisheries. The British Columbia data is available on computer from the Canadian Department of Fisheries and Oceans. Estimated catches are not available as yet for 1981 Alaska fisheries and 1983 Washington fisheries. Preliminary estimated catch data is available for 1984 fisheries in Alaska and British Columbia.

Catches of tagged fall chinook were expected to be completed in 1983 for the 1978 brood, 1984 for the 1979 brood and 1985 for the 1980 brood (Table 5). Estimated recoveries of fall chinook tagged for this project are presented by brood, hatchery and tag code in Tables 7 through 10.

Hatchery Returns

Returns of tagged fall chinook through 1984 are summarized by brood, rearing facility and year of return in Tables 11 through 14. As with the catches, returns of the 1978-brood fall chinook were completed in 1983, 1979

Table 6. **Factors to** be analyzed for the fall chinook study.

Brood	Hatchery	Disease History 1/	Rearing Environment 2/	Release Time and Size 3/	Release Location 4/	River Flow and Temp. 1/	Smolt Index 5/	Jones Beach Samp. 6/	Catch and Distrib. 1/	Returns 1/	Benefit/ Cost Ratios 1/
Within	Within	X	X	X	X	X	X	X	X	X	X
	Between	X	X	X	X	X		X	X	X	X
Between	Within	X	X	X		X	X		X	X	X
	Between								X		X

1/ All facilities all broods

2/ 78-brood: Grays River vs. Weyco Pond, Bonneville vs. Stayton Pond, Spring Creek vs. Big White Pond.
80-brood: Grays River vs. Weyco Pond, Bonneville vs. Stayton Pond vs. Clatsop County Ponds.
81-brood: Bonneville vs. Stayton Pond vs. Klaskanine vs. OxBow

3/ 78-brood: Speelyai, Spring Creek
79-brood: Cowlitz, Spring Creek
80-brood: Spring Creek
81-brood: Spring Creek, Cowlitz

4/ 80-brood: Spring Creek
81-brood: Spring Creek, Bonneville

5/ Measure of degree of smoltification based on ATPase, thyroxine, saltwater challenge tests, etc.
78-brood: Kalama Falls, Toutle, Bonneville, Big White, Elokomin, Washougal
79-brood: Spring Creek, Bonneville, Elokomin, Grays River

6/ All facilities

TABLE 7.--- Estimated recoveries of tagged 1978.- brood fall chinook from Columbia River facilities to Pacific coast fisheries by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
BIG CREEK	07-18-44	1980	0	13	19	0	0	0	0	32
		1981	0	219	143	27	0	0	0	389
		1982	0	74	20	0	0	0	68	162
		1983	0	10	0	0	0	0	0	10
		Total	0	316	182	27	0	0	68	593
BONNEVILLE	07-18-42	1980	0	14	49	0	0	2	5	70
		1981	0	264	237	57	0	4	7	569
		1982	0	99	6	0	0	9	70	184
		1983	0	0	0	0	0	0	0	0
		Total	0	377	292	57	0	15	82	823
	07-18-43	1980	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	0
		1982	0	0	0	0	4	0	0	4
		1983	0	0	0	0	0	0	0	0
		Total	0	0	0	0	4	0	0	4
KLASKANINE	07-18-45	1980	0	11	0	0	0	0	0	11
		1981	0	92	32	34	0	0	15	173
		1982	0	26	1	0	0	0	87	114
		1983	0	0	0	0	0	0	0	0
		Total	0	129	33	34	0	0	102	298
STAYTON POND	07-18-41	1980	0	40	58	0	0	0	0	98
		1981	0	735	520	119	4	0	0	1,378
		1982	0	174	47	2	12	0	130	365
		1983	0	5	0	0	0	0	3	8
		Total	0	954	625	121	16	0	133	1,849
SEA RESOURCES	63-19-18	1980	0	6	0	12	0	0	0	18
		1981	0	0	0	0	0	0	0	0
		1982	0	0	3	0	0	0	3	6
		1983	0	0	0	0	0	0	0	0
		Total	0	6	3	12	0	0	3	24

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish.
ABERNATHY	05-04-50	1980	0	11	14	0	0	0	0	25
		1981	0	165	60	15	5	0	0	245
		1982	0	17	0	0	0	0	6	23
		1983	0	0	0	0	0	0	0	0
		Total	0	193	74	15	5	0	6	293
	05-04-51	1980	0	12	12	0	0	0	0	24
		1981	0	57	50	26	0	0	0	133
		1982	0	4	4	4	0	0	9	21
		1983	0	0	0	0	0	0	0	0
		Total	0	73	66	30	0	0	9	178
BIG WHITE POND	05-04-43	1980	0	6	17	7	0	0	0	30
		1981	0	50	103	14	0	19	0	186
		1982	0	17	13	0	0	10	12	52
		1983	0	0	0	0	0	0	0	0
		Total	0	73	133	21	0	29	12	268
LITTLE WHITE SALMON	05-04-48	1980	0	0	0	0	0	0	0	0
		1981	0	12	11	0	0	5	0	28
		1982	0	0	0	0	0	3	0	3
		1983	0	0	0	0	0	0	0	0
		Total	0	12	11	0	0	8	0	31
	05-04-49	1980	0	2	0	0	0	0	0	2
		1981	0	0	11	5	0	0	0	16
		1982	0	10	0	0	0	8	0	18
		5983	0	0	0	0	0	0	0	0
		Total	0	12	11	5	0	8	0	36
SPRING CREEK	05-04-33	1980	0	14	80	0	0	11	2	107
		1981	0	352	425	115	0	200	0	1,092
		1982	0	64	30	7	0	64	50	215
		1983	0	0	0	0	0	4	0	4
		Total	0	430	535	122	0	279	52	1,418

Table 7 (Continued)

Marine Rearing facility	Tag code	Catch year	Columbia River					Total		
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
SPRING CREEK	05-04-44	1980	0	41	136	5	0	2	9	193
		1981	0	489	709	136	0	350	1	1,685
		1982	0	94	45	6	0	75	77	297
		1983	0	0	0	0	0	0	0	0
		Total	0	624	890	147	0	427	87	2,175
	05-04-45	1980	0	0	0	0	0	0	0	0
		1981	0	0	2	0	0	0	0	2
		1982	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0
		Total	0	0	2	0	0	0	0	2
	05-04-46	1980	0	14	40	13	0	14	11	92
		1981	0	340	383	56	0	146	2	927
		1982	0	57	16	2	0	43	50	168
		1983	0	0	0	0	0	2	5	7
		Total	0	411	439	71	0	205	68	1,194
COWLITZ	63-19-42	1980	0	0	0	0	0	0	0	0
		1981	0	29	32	15	0	0	0	76
		1982	7	56	49	25	0	0	18	155
		1983	1	4	0	0	0	0	0	5
		Total	8	89	81	40	0	0	18	236
	63-19-51	1980	0	0	0	0	0	0	0	0
		1981	0	5	19	2	0	0	0	26
		1982	1	18	13	4	0	0	5	41
		1983	0	0	0	0	0	0	0	0
		Total	1	23	32	6	0	0	5	67
ELOKOMIN	63-18-56	1980	0	3	0	0	0	0	0	3
		1981	0	4	0	0	0	0	0	4
		1982	0	0	0	0	0	0	3	3
		1983	0	0	0	0	0	0	0	0
		Total	0	7	0	0	0	0	3	10

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
ELOKOMIN	63-19-56	1980	0	3	0	0	0	0	0	3
		1981	0	4	3	0	0	0	0	7
		1982	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0
		Total	0	7	3	0	0	0	0	10
GRAYS RIVER	63-16-46	1980	0	0	0	0	0	0	0	0
		1981	0	0	0	2	0	0	2	4
		1982	0	16	0	0	0	0	6	22
		1983	4	0	0	0	0	0	0	4
		Total	4	16	0	2	0	0	8	30
	63-18-33	1980	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	0
		1982	0	4	0	0	0	0	0	4
		1983	0	0	0	0	0	0	0	0
		Total	0	4	0	0	0	0	0	4
	63-19-37	1980	0	0	0	0	0	0	0	0
		1981	0	0	7	11	0	0	2	20
		1982	1	0	4	0	0	0	3	8
		1983	0	0	0	0	0	0	0	0
		Total	1	0	11	11	0	0	5	28
KALAMA FALLS	63-19-57	1980	0	2	0	0	0	0	0	2
		1981	0	3	8	3	0	0	0	14
		1982	2	43	6	0	0	0	9	60
		1983	0	0	0	0	0	0	1	1
		Total	2	48	14	3	0	0	10	77
KLICKITAT	63-19-49	1980	0	4	5	0	0	0	5	14
		1981	0	63	50	7	0	9	0	129
		1982	1	42	22	0	0	21	12	98
		1983	0	0	0	0	0	0	0	0
		Total	1	109	77	7	0	30	17	241

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
PRIEST RAPIDS	63-18-21	1980	0	8	0	0	0	0	3	11
		1981	0	17	2	3	0	2	0	24
		1982	46	33	3	0	0	8	3	93
		1983	11	5	0	0	0	0	0	16
		Total	57	63	5	3	0	10	6	144
	63-18-57	1980	0	0	0	0	0	0	0	0
		1981	0	8	0	0	0	0	0	8
		1982	0	0	0	0	0	0	0	0
		1983	1	0	0	0	0	0	0	1
		Total	1	8	0	0	0	0	0	9
	63-19-58	1980	0	0	0	0	0	0	0	0
		1981	0	0	0	0	4	0	0	4
		1982	0	0	0	0	0	2	0	2
		1983	0	0	0	0	0	0	0	0
		Total	0	0	0	0	4	2	0	6
	63-20-17	1980	0	0	0	0	0	0	0	0
		1981	0	0	0	0	0	0	0	0
		1982	7	19	0	0	0	4	0	30
		1983	0	3	0	0	0	0	0	3
		Total	7	22	0	0	0	4	0	33
SPEELYAI	63-19-20	1980	0	7	0	0	0	0	0	7
		1981	0	12	30	0	0	0	0	42
		1982	10	27	17	11	0	0	6	71
		1983	2	0	0	0	0	0	0	2
		Total	12	46	47	11	0	0	6	122
	63-19-50	1980	0	2	0	0	0	0	0	2
		1981	0	20	22	9	0	0	0	51
		1982	10	55	25	0	0	0	24	114
		1983	0	9	0	0	0	0	0	9
		Total	10	86	47	9	0	0	24	176

Table 7 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
T0UTLE	63-10-54	1980	0	0	0	0	0	0	0	0
		1981	0	5	3	0	0	0	0	8
		1982	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0
		Total	0	5	3	0	0	0	0	8
	63-19-41	1980	0	1	0	0	0	0	0	1
		1981	0	20	3	0	0	0	0	23
		1982	3	49	6	15	0	0	18	91
		1983	0	0	0	0	0	0	0	0
		Total	3	70	9	15	0	0	18	115
WASHOUGAL	63-19-38	1980	0	0	0	0	0	0	0	0
		1981	0	35	0	0	0	0	0	35
		1982	0	11	8	0	0	0	15	34
		1983	0	0	0	0	0	0	0	0
		Total	0	46	8	0	0	0	15	69
	63-19-46	1980	0	2	0	0	0	0	0	2
		1981	0	19	18	8	0	0	0	45
		1982	4	49	3	0	0	0	15	71
		1983	4	0	0	0	0	0	0	4
		Total	8	70	21	8	0	0	15	122
WEYCO POND	63-19-39	1980	0	0	0	0	0	0	0	0
		1981	0	35	2	0	0	0	3	40
		1982	1	4	8	0	0	0	8	21
		1983	0	0	0	0	0	0	0	0
		Total	1	39	10	0	0	0	11	61
Grand total			116	4,368	3,664	777		1,017		10,754

TABLE 8.-- Estimated recoveries of tagged 1979-- brood fall chinook from Columbia River facilities to Pacific coast fisheries; by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish.
BIG CREEK	07-21-60	1981	0	81	29	4	0	0	0	114
		1982	2	461	342	55	6	0	106	972
		1983	0	71	0	0	0	0	45	116
		1984	0	4	0	0	0	0	0	4
		Total	2	617	371	59	6	0	151	1,206
BONNEVILLE	07-21-57	1981	0	1	0	0	0	0	0	1
		1982	0	52	36	0	0	0	24	112
		1983	0	22	0	0	0	2	0	24
		Total	0	75	36	0	0	2	24	137
KLASKANINE	07-21-61	1981	0	4	4	0	0	0	0	8
		1982	0	32	14	1	0	0	25	72
		1983	0	5	0	2	0	0	11	18
		Total	0	41	18	3	0	0	36	98
OXBOW	07-21-62	1981	0	0	0	0	0	0	0	0
		1982	0	16	14	2	0	0	6	38
		1983	0	13	0	0	0	0	3	16
		Total	0	29	14	2	0	0	9	54
	07-21-63	1981	0	0	2	0	0	0	0	2
		1982	0	40	25	9	0	0	9	83
		1983	0	7	0	0	0	0	3	10
		Total	0	47	27	9	0	0	12	95
STAYTON FOND	07-20-55	1981	0	46	187	7	0	0	0	240
		1982	0	528	691	109	3	0	201	1,532
		1983	0	97	0	0	0	0	18	115
		1984	0	4	0	0	0	0	0	4
		Total	0	675	878	116	3	0	219	1,891
SEA RESOURCES	63-20-61	1981	0	1	2	0	0	0	0	3

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
SEA RESOURCES	63-20-61	1982	0	6	5	0	0	0	11	22
		1983	7	8	0	0	0	0	0	15
		Total	7	15	7	0	0	0	11	40
ABERNATHY	05-06-44	1981	0	0	26	4	0	0	0	30
		1982	0	46	61	4	8	0	24	143
		1983	0	5	0	0	0	0	1	6
		Total	0	51	87	8	8	0	25	179
	05-06-46	1981	0	5	59	9	0	0	0	73
		1982	0	135	200	49	0	0	32	416
		1983	0	10	0	0	0	0	8	18
		Total	0	150	259	58	0	0	40	507
LITTLE WHITE SALMON	05-06-43	1981	0	0	0	0	0	0	0	0
		1982	0	18	20	0	0	2	6	46
		1983	0	0	0	0	0	0	0	0
		Total	0	18	20	0	0	2	6	46
SPRING CREEK	05-06-39	1981	0	34	114	23	0	41	0	212
		1982	0	226	325	40	10	151	142	894
		1983	0	12	0	0	0	9	3	24
		Total	0	272	439	63	10	201	145	1,130
	05-06-40	1981	0	15	110	11	0	52	0	188
		1982	0	247	366	59	0	165	168	1,005
		1983	0	18	0	0	0	12	7	37
		Total	0	280	476	70	0	229	175	1,230
	05-06-41	1981	0	54	148	5	0	59	0	266
		1982	0	161	325	35	8	206	159	894
		1983	0	9	0	0	0	12	4	25
		Total	0	224	473	40	8	277	163	1,185

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
SPRING CREEK	05-06-42	1981	0	0	0	0	0	0	0	0
		1982	0	11	31	6	5	9	6	68
		1983	0	21	0	0	0	0	5	26
		Total	0	32	31	6	5	9	11	94
COWLITZ	63-21-37	1981	0	0	2	0	0	0	0	2
		1982	0	4	69	10	0	0	3	86
		1983	0	59	0	6	0	0	5	70
		Total	0	63	71	16	0	0	8	158
	63-21-54	1981	0	8	0	0	0	0	0	8
		1982	0	15	74	6	0	0	12	107
		1983	19	48	0	0	0	0	11	78
		1984	0	11	0	0	0	0	0	11
		Total	19	82	74	6	0	0	23	204
	63-21-59	1981	0	0	0	0	0	0	0	0
		1982	0	12	26	3	0	0	3	44
		1983	3	3	0	3	0	0	0	9
		Total	3	15	26	6	0	0	3	53
ELOKOMIN	63-20-05	1981	0	0	0	0	0	0	6	6
		1982	0	7	11	12	0	0	3	33
		1983	0	16	0	0	0	0	6	22
		Total	0	23	11	12	0	0	15	61
GRAYS RIVER	63-20-43	1981	0	0	0	0	0	0	0	0
		1982	3	18	9	2	0	0	3	35
		1983	3	10	0	0	0	0	3	16
		1984	0	9	0	0	0	0	0	9
		Total	6	37	9	2	0	0	6	60
KALAMA FALLS	63-21-05	1981	0	8	0	0	0	0	0	8
		1982	0	35	30	6	0	0	3	74

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
KALAMA FALLS	63-21-05	1983	10	58	0	3	0	0	5	76
		1984	0	7	0	0	0	0	0	7
		Total	10	108	30	9	0	0	8	165
KLICKITAT	63-19-47	1981	0	8	4	6	0	0	0	18
		1982	0	54	76	7	17	4	18	176
		1983	9	32	0	1	0	11	0	53
		Total	9	94	80	14	17	15	18	247
LEWIS RIVER	63-21-60	1981	0	19	0	0	0	0	0	19
		1982	0	53	43	17	0	0	3	116
		5983	19	89	0	20	0	0	11	139
		1984	0	6	0	0	0	0	0	6
		Total	19	167	43	37	0	0	14	280
LOWER KALAMA	63-20-06	1981	0	0	3	3	0	0	0	6
		1982	2	57	23	5	0	0	6	93
		1983	6	25	0	0	0	0	10	41
		1984	0	11	0	0	0	0	0	11
		Total	8	93	26	8	0	0	16	151
PRIEST RAPIDS	63-19-48	1981	0	4	0	0	0	0	0	4
		1982	9	76	13	8	0	4	11	121
		1983	108	57	0	0	0	31	13	209
		1984	32	18	0	0	0	0	0	50
		Total	149	155	13	8	0	35	24	384
WASHOUGAL	63-21-53	1981	0	9	0	0	0	0	0	9
		1982	15	144	147	13	10	5	24	358
		1983	37	174	0	4	0	19	13	247
		1984	2	13	0	0	0	0	0	15
		Total	54	340	147	17	10	24	37	629
WEYCO POND	H1-02-03	1981	0	0	0	0	0	0	0	0

Table 8 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Canada	Washington	Oregon	California	Columbia River: Indian	Non-Indian	Total: All fish
WEYCO POND	H1-02-03	1982	0	12	26	2	0	0	15	55
		1983	0	8	0	0	0	0	1	9
		Total	0	20	26	2	0	0	16	64
	Grand total		286	3,723	3,692	571	67	794	1,215	10,348

TABLE 9 -- Estimated recoveries of tagged 1980- brood fall chinook from Columbia River facilities to Pacific coast fisheries by facility, tag code and catch year.

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
CLATSOP COUNTY PONDS	07-21-58	1982	0	3	0	0	0	0	0	3
		1983	0	29	0	0	0	0	6	35
		1984	0	14	0	0	0	0	0	14
		Total	0	46	0	0	0	0	6	52
	07-21-59	1982	0	1	20	0	0	0	0	21
		1983	0	129	0	3	0	0	33	165
		1984	0	12	0	0	0	0	0	12
		Total	0	142	20	3	0	0	33	198
BIG CREEK	07-23-31	1982	0	1	5	0	0	0	0	6
		1983	0	77	0	0	0	0	15	92
		1984	0	16	0	0	0	0	0	16
		Total	0	94	5	0	0	0	15	114
	07-23-33	1982	0	5	4	0	0	0	0	9
		1983	0	30	0	7	0	0	3	40
		1984	0	8	0	0	0	0	0	8
		Total	0	43	4	7	0	0	3	57
	07-23-34	1982	0	0	0	0	0	0	0	0
		1983	0	38	0	2	0	0	12	52
		Total	0	38	0	2	0	0	12	52
BONNEVILLE	07-21-56	1982	0	5	24	3	0	2	0	34
		1983	0	95	0	5	0	2	12	114
		1984	0	24	0	0	0	0	0	24
		Total	0	124	24	8	0	4	12	172
	07-23-29	1982	0	0	3	2	0	0	0	5
		1983	0	88	0	4	0	2	5	99
		1984	0	15	0	0	0	0	0	15
		Total	0	103	3	6	0	2	5	119

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
KLASKANINE	07-22-27	1982	0	0	0	0	0	0	1	1
		1983	0	0	0	0	0	0	3	3
		Total	0	0	0	0	0	0	4	4
	07-23-32	1982	0	0	0	0	0	0	1	1
		1983	0	31	0	0	0	0	21	52
		Total	0	31	0	0	0	0	22	53
STAYTON POND	07-23-35	1982	0	10	76	0	3	0	0	89
		1983	0	284	0	13	0	0	33	330
		1984	0	48	0	0	0	0	0	48
		Total	0	342	76	13	3	0	33	467
SEA RESOURCES	63-22-0 1	1982	0	0	0	0	0	0	2	2
		1983	0	20	0	0	0	0	14	34
		Total	0	20	0	0	0	0	16	36
ABERNATHY	05-07-44	1982	0	7	22	0	0	0	3	32
		1983	0	90	0	2	0	12	6	110
		1984	2	3	0	0	0	0	0	5
		Total	2	100	22	2	0	12	9	147
	05-07-45	1982	0	33	70	4	0	0	12	119
		1983	0	152	0	8	0	2	16	178
		1984	0	5	0	0	0	0	0	5
		Total	0	190	70	12	0	2	28	302
LITTLE WHITE SALMON	05-07-47	1982	0	0	0	0	0	0	0	0
		1983	0	20	0	0	0	0	5	25
		1984	0	4	0	0	0	0	0	4
		Total	0	24	0	0	0	0	5	29
	05-08-49	1982	0	0	0	0	0	0	0	0

Table 9 (Continued)

Rearing facility	Tog code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
LITTLE WHITE SALMON	05-08-49	1983	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0
	05-08-50	1982	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	2	0	2
		Total	0	0	0	0	0	2	0	2
SPRING CREEK	05-07-40	1982	0	1	0	0	0	0	0	1
		1983	0	31	0	2	0	18	11	62
		1984	0	18	0	0	0	0	0	18
		Total	0	50	0	2	0	18	11	81
	OS-07-41	1982	0	6	11	0	0	0	0	17
		1983	0	37	0	0	0	6	5	48
		1984	0	9	0	0	0	0	0	9
		Total	0	52	11	0	0	6	5	74
	05-07-42	1982	0	0	5	0	0	0	0	5
		1983	0	70	0	0	0	11	8	89
		1984	0	7	0	0	0	0	0	7
		Total	0	77	5	0	0	11	8	101
	05-07-43	1982	0	0	22	0	0	2	0	24
		1983	0	94	0	3	0	23	3	123
		1984	0	11	0	0	0	0	0	11
		Total	0	105	22	3	0	25	3	158
	05-07-46	1982	0	8	58	2	0	9	0	77
		1983	0	418	0	30	0	190	43	681
		1984	0	64	0	0	0	0	0	64
		Total	0	490	58	32	0	199	43	822
	05-07-48	1982	0	6	4	0	0	0	0	10

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
SPRING CREEK	05-07-48	1983	0	6	0	4	0	2	3	15
		Total	0	12	4	4	0	2	3	25
	05-07-49	1982	0	0	0	0	0	0	3	3
		1983	0	40	0	0	0	2	0	42
		1984	0	5	0	0	0	0	0	5
		Total	0	45	0	0	0	2	3	50
	OS-07-50	1982	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0
	05-07-51	1982	0	0	0	0	0	2	0	2
		1983	0	5	0	0	0	2	3	10
		Total	0	5	0	0	0	4	3	12
	05-07-52	1982	0	0	0	0	0	0	0	0
		1983	0	5	0	0	0	0	0	5
		1984	0	3	0	0	0	0	0	3
		Total	0	8	0	0	0	0	0	8
COWLITZ	63-21-56	1982	0	10	0	0	0	0	0	10
		1984	0	71	0	18	0	0	10	99
		1984	19	200	0	0	0	0	0	219
		Total	19	281	0	18	0	0	10	328
	63-22-55	1982	0	2	0	0	0	0	3	5
		1983	0	48	0	2	0	0	3	53
		1984	15	60	0	0	0	0	0	75
		Total	15	110	0	2	0	0	6	133
ELOKOMIN	63-22-34	1982	0	0	0	0	0	0	0	0
		1983	0	53	0	4	0	0	1	58

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
ELOKOMIN	63-22-34	1984	9	22	0	0	0	0	0	31
		Total	9	75	0	4	0	0	1	89
	63-23- 17	1982	0	0	0	0	0	0	0	0
		1983	0	0	0	4	0	0	0	4
		1984	1	23	0	0	0	0	0	24
		Total	1	23	0	4	0	0	0	28
GRAYS RIVER	63-22-63	1982	0	4	0	0	0	0	0	4
		1983	7	0	0	2	0	0	0	9
		1984	9	42	0	0	0	0	0	51
		Total	16	46	0	2	0	0	0	64
	63-23-40	1982	0	0	0	0	0	0	0	0
		1983	0	8	0	0	0	0	0	8
		1984	0	18	0	0	0	0	0	18
		Total	0	26	0	0	0	0	0	26
KALAMA FALLS	63-20-36	1982	0	4	0	0	0	0	0	4
		1983	4	45	0	0	0	0	0	49
		1984	18	67	0	0	0	0	0	85
		Total	22	116	0	0	0	0	0	138
KLICKITAT	63-20-08	1982	0	3	0	0	0	0	0	3
		1983	0	9	0	0	0	0	0	9
		1984	0	15	0	0	0	0	0	15
		Total	0	27	0	0	0	0	0	27
LOWER KALAMA	63-22-54	1982	2	21	6	0	0	0	0	29
		1983	0	131	0	7	0	0	0	138
		1984	47	171	0	0	0	0	0	218
		Total	49	323	6	7	0	0	0	385

Table 9 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
PRIEST RAPIDS	63-21-55	1982	1	12	0	0	0	0	0	13
		1983	6	73	0	0	0	15	4	98
		1984	37	188	0	0	0	0	0	225
		Total	44	273	0	0	0	15	4	336
	63-22-61	1982	0	4	0	0	0	2	0	6
		1983	3	35	0	0	0	2	0	40
		1984	70	94	0	0	0	0	0	164
		Total	73	133	0	0	0	4	0	210
WASHOUGAL	63-21-48	1982	0	3	0	0	0	0	0	3
		1983	0	6	0	0	0	0	0	6
		1984	4	36	0	0	0	0	0	40
		Total	4	45	0	0	0	0	0	49
	63-22-51	1982	0	10	0	0	0	0	3	13
		1983	4	38	0	2	3	0	5	52
		1984	46	114	0	0	0	0	0	160
		Total	50	162	0	2	3	0	8	225
WEYCO POND	H1-03-01	1982	0	0	0	0	0	0	0	0
		1983	0	6	0	0	0	0	0	6
		1984	0	11	0	0	0	0	0	11
		Total	0	17	0	0	0	0	0	17
	H1-03-02	1982	0	0	0	0	0	0	0	0
		1983	0	0	0	0	0	0	0	0
		1984	2	0	0	0	0	0	0	2
		Total	2	0	0	0	0	0	0	2
Grand total			306	3,798	330	133	6	308	311	5,192

TABLE 10.-- Estimated recoveries of tagged 1981- brood fill chinook from Columbia River facilities to Pacific: coast fisheries by facility, tag code and catch year

Rearing facility	Tag code	Catch year	Number of recoveries: Marine					Columbia River		Total
			Alaska	Canada	Washington	Oregon	California	Indian	Non-Indian	All fish
CLATSOP COUNTY PONDS	07-24-12	1983	0	4	0	0	0	0	0	4
		1984	0	25	0	0	0	0	0	25
		Total	0	29	0	0	0	0	0	29
	07-24-13	1983	0	3	0	0	0	0	0	3
		1984	0	0	0	0	0	0	0	0
		Total	0	3	0	0	0	0	0	3
BIG CREEK	07-24-10	1983	0	11	0	0	0	0	0	11
		1984	0	302	0	0	0	0	0	302
		Total	0	313	0	0	0	0	0	313
BONNEVILLE	07-24-07	1983	0	8	0	0	5	2	0	15
		1984	0	247	0	0	0	0	0	247
		Total	0	255	0	0	5	2	0	262
	07-24-08	1983	0	1	0	0	0	0	0	1
		1984	0	45	0	0	0	0	0	45
		Total	0	46	0	0	0	0	0	46
	07-26-63	1983	0	9	0	0	0	2	0	11
		1984	0	173	0	0	0	0	0	173
		Total	0	182	0	0	0	2	0	184
KLASKANINE	07-24-09	1983	0	0	0	0	0	0	0	0
		1984	0	34	0	0	0	0	0	34
		Total	0	34	0	0	0	0	0	34
OXBOW	07-23-30	1993	0	8	0	0	0	0	0	8
		1984	0	14	0	0	0	0	0	14
		Total	0	22	0	0	0	0	0	22

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
OXBOW	07-24-11	1983	0	0	0	0	0	0	0	0
		1984	0	4	0	0	0	0	0	4
		Total	0	4	0	0	0	0	0	4
STAYTON POND	07-26-62	1983	0	30	0	0	0	0	0	30
		1984	0	616	0	0	0	0	0	616
		Total	0	646	0	0	0	0	0	646
SEA RESOURCES	63-24-57	1983	0	1	0	0	0	0	3	4
		1984	0	126	0	0	0	0	0	126
		Total	0	127	0	0	0	0	3	130
ABERNATHY	05-50-58	I.983	0	1	0	0	0	0	3	4
		1984	0	71	0	0	0	0	0	71
		Total	0	72	0	0	0	0	3	75
	05-10-59	1983	0	0	0	0	0	0	0	0
		1984	0	18	0	0	0	0	0	18
		Total	0	18	0	0	0	0	0	18
LITTLE WHITE SALMON	05-04-35	1983	0	0	0	0	0	0	0	0
		1984	0	10	0	0	0	0	0	10
		Total	0	10	0	0	0	0	0	10
	05-04-S	1983	0	0	0	0	0	0	0	0
		1984	0	3	0	0	0	0	0	3
		Total	0	3	0	0	0	0	0	3
SPRING CREEK	05-07-53	1983	0	0	0	0	0	0	0	0
		1984	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
SPRING CREEK	05-07-54	1983	0	0	0	0	0	0	0	0
		1984	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0
	05-08-51	1983	0	0	0	2	0	10	0	12
		1984	0	88	0	0	0	0	0	88
		Total	0	88	0	2	0	10	0	100
	05-10-50	1983	0	1	0	2	0	15	3	21
		1984	0	110	0	0	0	0	0	110
		Total	0	111	0	2	0	15	3	131
	05-10-51	1983	0	0	0	5	0	0	0	5
		1984	0	16	0	0	0	0	0	16
		Total	0	16	0	5	0	0	0	21
	05-10-52	1983	0	2	0	6	0	5	0	13
		1984	0	157	0	0	0	0	0	157
		Total	0	159	0	6	0	5	0	170
	05-10-57	1983	0	7	0	0	0	8	0	15
		1984	0	219	0	0	0	0	0	219
		Total	0	226	0	0	0	8	0	234
COWLITZ	63-20-32	1983	0	0	0	0	0	0	0	0
		1984	0	9	0	0	0	0	0	9
		Total	0	9	0	0	0	0	0	9
	63-24-50	1983	0	3	0	0	0	0	0	3
		1984	0	0	0	0	0	0	0	0
		Total	0	3	0	0	0	0	0	3

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
COWLITZ	63-24-62	1983	0	2	0	0	0	0	0	2
		1984	0	31	0	0	0	0	0	31
		Total	0	33	0	0	0	0	0	33
	63-26-03	1983	0	3	0	0	0	0	0	3
		1984	0	6	0	0	0	0	0	6
		Total	0	9	0	0	0	0	0	9
ELOKOMIN	63-22-42	1983	0	0	0	0	0	0	0	0
		1984	0	7	0	0	0	0	0	7
		Total	0	7	0	0	0	0	0	7
	63-22-60	1983	0	0	0	0	0	0	0	0
		1984	0	8	0	0	0	0	0	8
		Total	0	8	0	0	0	0	0	8
GRAYS RIVER	63-24-58	1983	0	0	0	0	0	0	0	0
		1984	0	3	0	0	0	0	0	3
		Total	0	3	0	0	0	0	0	3
	63-24-59	1983	0	2	0	0	0	0	0	2
		1984	0	4	0	0	0	0	0	4
		Total	0	6	0	0	0	0	0	6
KALAMA FALLS	63-24-60	1983	0	7	0	0	0	0	0	7
		1984	0	41	0	0	0	0	0	41
		Total	0	48	0	0	0	0	0	48
KLICKITAT	63-21-57	1983	0	0	0	0	0	0	0	0
		1984	0	35	0	0	0	0	0	35
		Total	0	35	0	0	0	0	0	35

Table 10 (Continued)

Rearing facility	Tag code	Catch year	Number of recoveries: Marine: Alaska	Marine: Canada	Marine: Washington	Marine: Oregon	Marine: California	Columbia River: Indian	Columbia River: Non-Indian	Total: All fish
LOWER KALAMA	63-24-63	1983	0	11	0	0	0	0	0	11
		1984	0	53	0	0	0	0	0	53
		Total	0	64	0	0	0	0	0	64
PRIEST RAPIDS	63-22-52	1983	0	20	0	0	0	2	0	22
		1984	6	148	0	0	0	0	0	154
		Total	6	168	0	0	0	2	0	176
	63-24-56	1983	0	14	0	0	0	0	0	14
		1984	10	36	0	0	0	0	0	46
		Total	10	50	0	0	0	0	0	60
WASHOUGAL	63-24-61	1983	0	10	0	0	0	0	0	10
		1984	1	26	0	0	0	0	0	27
		Total	1	36	0	0	0	0	0	37
WEYCO POND	H1-04-06	1983	0	2	0	0	0	0	0	2
		1984	0	10	0	0	0	0	0	10
		Total	0	12	0	0	0	0	0	12
Grand total			17	2,855	0	15	5	44	9	2,945

Table 11.--Tag returns of 1978-brood fall chinook by rearing facility, tag code and return year (estimated returns in brackets)

Rearing Facility	Tag code	Return Year 1980	1981	1982	1983	Total (estimated)
Abernathy	S-4-50	3[8]	35[48]	13[24]	0	80
	5-4-51	1	24[29]	16[24]	0	54
Big White	5-4-43	6	28	24[73]	1	108
Little White Salmon	5-4-48	1	6[9]	2	1	13
	5-4-49	0	4	5	1	10
Spring Creek	5-4-46	18	122	50	1	191
	5-4-44	34	242	84	3	363
	5-4-33	26	175[180]	42	0	248
	5-4-45	1	0	0	0	1
Big Creek	7-18-44	3	52[62]	125[130]	10	205
Bonneville	7-18-42	12	197	95	3	307
	7-18-43	0	3	1	0	4
Klaskanine	7-18-45	0	4	9	1	14
Stayton Pond	7-18-41	1	93	156	4	254
Cowlitz	63-19-42	51[9]	25[26]	59[66]	7	118
	63-19-51	0	8	14[16]	2	26
Elokomin	63-18-56	0	0	0	1	1
	63-19-56	0	0	1	0	1
Grays River	63-16-46	1	3	4[5]	2	11
	63-18-33	0	0	2	0	2
	63-19-37	0	5	3	0	8
Kalama Falls	63-19-57	1	2	17[47]	15	65
Klickitat	63-19-49	0	0	0	0	0
Priest Rapids	63-18-21	3[16]	15[52]	27[97]	4	169
	63-18-57	0	0	2[11]	0	11
	63-20-17	0	5[8]	9	1	18
	63-19-58	0	1	0	0	1
Sea Resources	63-19-18	0	0	0	0	0
Speelyai	63-19-20	0	3[11]	12[27]	2	40
	63-19-50	4[6]	3	19[48]	4	71

Table 11 (Continued)

Rearing Facility	Tag code	Return Year 1980	1981	1982	1983	Total (estimated)
Toutle	63-18-54	0	0	3	0	3
	63-19-41	2[5]	5	28[36]	3	49
Washougal	63-19-38	0	2	17[20]	4	26
	63-19-46	0	12[34]	26[36]	2	72
Weyco Pond	63-19-39	0	0	9	0	9

Table 12.--Tag returns of 1979-brood fall chinook by rearing facility, tag code and return year (estimated returns in brackets)

Rearing Facility	Tag Code	Return Year 1981	1982	1983	1984	Total estimated
Abernathy	5-6-44	9(14)	20(28)	3	0	45
	S-6-46	26(34)	71(118)	17	0	169
Little White Salmon	5-6-43	0	1	1	0	2
Spring Creek	5-6-39	45	134(144)	18	0	207
	S-6-40	46	109(129)	25	0	200
	5-6-41	32	83(85)	20	0	137
	5-6-42	0	8	7	0	15
Big Creek	7-21-60	8	171(181)	99	1	289
Bonneville	7-21-57	3	17	11	0	31
Klaskanine	7-21-61	0	2	0	0	2
OXBOW	7-21-62	2	1	5	0	8
	7-21-63	1	7	6	0	14
Stayton Pond	7-20-55	0	159	28	0	187
Cowlitz	63-21-37	9	20	33	2	64
	63-21-54	2	22(27)	36	2	67
	63-21-59	0	6(11)	13	2	26
Elokomin	63-20-S	0	4	8	1	13
Grays River	63-20-43	0	5	5	0	10
Kalama Falls	63-21-5	0	9(13)	67	9	89
Klickitat	63-19-47	1	6	3	0	10
Lewis River	63-21-60	1(9)	10(29)	23	7	68
Lower Kalama	63-20-6	0	4(6)	34	10	50
Priest Rapids	63-19-48	22(39)	65(114)	60	19	232
Sea Resources	63-20-61	3	15(16)	3	1	23
Washougal	63-21-53	5	84(91)	157	9	262
Weyco Pond	H l-2-3	0	23(25)	6	1	32

Table 13.--Tag returns of 1980-brood fall chinook by rearing facility, tag code, and return year (estimated returns in brackets)

Rearing facility	Tag code	Return Year 1982	1983	1984
Abernathy	5-7-44	17[23]	21	1
	5-7-45	44[56]	99	3
Little White Salmon	5-7-47	0	3	6
	5-8-49	1 1/	1	2
	5-8-50	0	0	0
Spring Creek	5-7-40	1	14	8
	5-7-41	4	22	11
	5-7-42	0	17	5
	5-7-43	0	1	0
	5-7-46	1[5]	6	0
	5-7-48	0	1	0
	5-7-49	0	10	4
	5-7-50	0	3	0
	5-7-51	0	0	0
	5-7-52		2	2
Big Creek	7-23-31	2[4]	16	5
	7-23-33	4	21	12
	7-23-34	0	14	10
Bonneville	7-21-56	12	81	8
	7-23-29	6	47	5
Clatsop County Ponds	7-21-58	0	4	3
	7-21-59		2	6
Klaskanine	7-22-27	0	2	1
	7-23-32	0	3	1
Stayton Pond	7-23-35	4	56	28[60]
Cowlitz	63-21-56	26[27]	97	128
	63-22-55	4	16	60
Elokomin	63-22-34	1	7	16
	63-23-17	0	2	5
Grays River	63-22-63		2	13
	63-23-40	0	0	0

l/ Fish returned in 1981

Table 13 (continued)

Rearing Facility	Tag Code	Return Year 1982	1983	1984
Kalama Falls	63-20-36	0	21	50
Klickitat	63-20-8	1	0	0
Lower Kalama	63-22-54	0	34	126
Priest Rapids	63-21-55	9	36	75
	63-22-61	3[130]	17	43
Sea Resources	63-22-l	0	3	2
Washougal	63-21-48	1	20	28
	63-22-51	2[4]	45	76[77]
Weyco Pond	H 1-3-1	1	2	2
	H l-3-2	0	1	5

Table 14.--Tag returns of 1981-brood fall chinook by rearing facilities, tag code and return year

Rearing Facility	Tag Code	Return Year 1983	1984
Abernathy	5-l0-58	5	26
	5-10-59	3	10
Little White Salmon	5-4-35	0	1
	5-4-36	0	0
Spring Creek	5-7-53	0	0
	5-7-54	0	0
	5-8-51	0	0
	5-10-50	12	44
	5-10-51	2	18
	5-10-52	7 [1/]	44
	5-10-57	0	1
Big Creek	7-24-10	2	86
Bonneville	7-24-7	3	71
	7-24-8	0	7
	7-26-63	0	1
Clatsop County Ponds	7-24-12	0	2
	7-24-13	0	1
Klaskanine	7-24-9	0	1
OxBow	7-23-30	0	1
	7-24-11	0	1
Stayton Pond	7-26-62	0	169[360]
Cowlitz	63-20-32	o	0
	63-24-50	o	0
	63-24-62	4	24
	63-26-03	o	0
Elokomin	63-22-42	0	o
	63-22-60	0	1
Grays River	63-24-58	0	o
	63-24-59	0	1
Kalama Falls	63-24-60	0	5

[1/] one fish returned in 1982.

Table 14 (Continued)

Rearing Facility	Tag Code	Return Year 1983	1984
Klickitat	63-21-57	0	0
Lower Kalama	63-24-63	1	7
Priest Rapids	63-22-52	4	64
	63-24-56	2	25
Sea Resource	63-24-57	1	36
Washougal	63-24-61	1	7
Weyco Pond	H1-4-6	0	3

brood in 1984 and 1980 brood in 1985. Appendix Tables 1 through 13 present the returns of tagged fish in more detail by brood, year of return, rearing facility and the site of return of the tagged fish. The total returns for 1980 through 1984 are listed in Table 15 by return facility. Appendix Tables 14 through 19 present the returns by return year, facility and sex of fish.

Returns to facilities in 1985 are not complete; although returns to USFWS and ODFW facilities are very nearly so. It is already apparent some hatcheries are having the lowest returns since 1980 (Spring Creek and Little White Salmon) while others will have the largest return (Big Creek, Cowlitz, Priest Rapids and Willamette Falls). Bonneville Hatchery has a larger return than 1984 but considerably smaller than returns from 1980 through 1983. It is too early to determine if returns to most of the WDF facilities will be above or below those in 1984.

Comparisons of individual hatchery returns over the five years is complicated by several factors. The effects of openings and closings of commercial gillnet seasons in the Columbia River have differing influences on different hatcheries in the Columbia. Returns to hatcheries on small streams (Abernathy, Big Creek, Klaskanine, Elokomin, Grays River and Lower Kalama) are influenced by the date and quantity of the first fall rains. In general the earlier the beginning of the rains the larger the return to these facilities. Also some hatcheries are not efficient at capturing returning jack salmon, particularly those where salmon are trapped in the stream below the hatchery (Elokomin and Kalama Falls). Some of the jack salmon can swim through the bars of the traps.

Observations

Final estimated catch data are not yet available for any complete brood of fall chinook marked for this study. Values are available for the major fall chinook fisheries through 1983 except for Washington and Alaska. Fall chinook from the Columbia River contribute predominately to British Columbia marine troll, Washington and Oregon marine sport and troll and Columbia River gillnet fisheries. While catch data are not complete for any one brood, sufficient data are available to compare contributions for the 1978 and 1979 broods of fall chinook. Releases, catches and returns by rearing facility and tag code for the 1978 and 1979 broods are compared in Tables 16 and 17. The percent survival values in Table 16 and 17 were calculated by summing the catches and returns and dividing by the number of fish released.

The catch per 1,000 releases and percent survival values are minimal for both broods. Estimated catches of wire tagged fish in Alaska are not available for 1981. Estimated catches of five-year-old chinook for the 1978 brood are not yet available for the Washington fisheries. For the 1979 brood, catches of four-year-old chinook in the Washington fisheries in 1983 and five-year-old fish in Washington, Oregon, California and Columbia River fisheries are not available. Only preliminary data are available for catches of coded-wire-tagged salmonids in 1984 in Alaskan and Canadian fisheries. Also the possibility of post release mortality of wire tagged fish due to the effects of marking has not yet been examined.

Table 15. --Total fall chinook returns to Columbia River facilities participating in the BPA funded fall chinook evaluation project, 1980-1984.

Hatchery	Return year	Adults	Jacks	Total
Abernathy	1980	610	130	740
	1981	1,282	743	2,025
	1982	2,065	1,016	3,081
	1983	1,950	192	2,142
	1984	557	185	742
Little White Salmon	1980	1,559	114	1,673
	1981	1,241	256	1,497
	1982	2,047	101	2,148
	1983	1,139	53	1,192
	1984	560	17	577
Spring Creek	1980	24,610	2,822	27,432
	1981	23,862	6,662	30,524
	1982	26,708	739	27,447
	1983	9,403	1,005	10,408
	1984	8,697	799	9,496
Big Creek	1980	2,791	70	2,861
	1981	3,791	526	4,317
	1982	10,245	400	10,645
	1983	3,912	75	3,987
	1984	6,168	368	6,536
Bonneville	1980	19,159	2,202	21,361
	1981	29,103	5,162	34,265
	1982	21,081	2,199	23,280
	1983	12,816	585	13,401
	1984	5,234	244	5,478
Cascade	1980	1,753	104	1,857
	1981	234	15	249
	1982	814	76	890
	1983 1/	1727	108	1,835
	1984	157	4	161
Clatsop County Ponds	1980	0	0	0
	1981	0	0	0
	1982	0	0	0
	1983	5	0	5
	1984	0	62	62

l/ includes 1,268 adult and 87 jack upper river bright stock

Table 15 (Continued)

Hatchery	Return year	Adults	Jacks	Total
Klaskanine	1980	114	1	115
	1981	60	3	63
	1982	94	3	97
	1983	47	1	48
	1984	41	0	41
Cowlitz	1980	1,968	221	2,189
	1981	4,697	976	5,673
	1982	4,767	1,023	5,790
	1983	6,300	147	6,447
	1984	5,840	169	6,009
Elokomin [2/]	1980	1,074	0	1,074
	1981	633	1	634
	1982	2,056	6	2,062
	1983	2,690	1	2,691
	1984	1,714	10	1,714
Grays River	1980	91	6	97
	1981	59	26	85
	1982	678	23	701
	1983	273	1	274
	1984	169	68	237
Kalama Falls	1980	4,532	167	4,699
	1981	4,220	74	4,294
	1982	806	86	892
	1983	3,866	9	3,875
	1984	3,894	13	3,907
Kalama Falls [3/]	1980	80	175	255
	1981	546	24	570
	1982	329	19	348
	1983	842	30	872
	1984	484	0	484
Klickitat	1980	99	115	214
	1981	282	0	282
	1982	314	23	337
	1983	147	13	160
	1984	138	2	140

2/ Includes 619 adults transported from Kalama Falls Hatchery
3/ Bright fall chinook

Table 15 (Continued)

Hatchery	Return year	Adults	Jacks	Total
Lewis River	1980	647	46	693
	1981	630	116	746
	1982	219	147	366
	1983 [4/]	515	80	595
	1984	159	195	354
Lower Kalama	1980	2,420	359	2,779
	1981	1,375	161	1,536
	1982	736	84	820
	1983	685	6	691
	1984	1,348	30	1,378
Lower Kalama [3/]	1980			
	1981			
	1982	472	271	743
	1983	457	89	546
	1984	1	0	1
Priest Rapids	1980	2,192	2,564	4,756
	1981	2,380	1,523	3,903
	1982	3,531	4,201	7,732
	1983	4,810	1,214	6,024
	1984	7,653	5,581	13,234
Ringold	1980			
	1981			
	1982	177	14	191
	1983	176	28	204
	1984	0	0	0
Sea Resources	1980	123	3	126
	1981	197	32	229
	1982	424	4	428
	1983	253	24	277
	1984	847	10	857
Washougal	1980	1,717	121	1,838
	1981	3,656	104	3,760
	1982	2,548	260	2,808
	1983	4,032	26	4,058
	1984	2,077	139	2,116

4/ Includes 35 adult and 4 jack upper river bright stock

Table 15 (Continued)

Hatchery	Return year	Adults	Jacks	Total
Willamette Falls	1980	7,760	625	8,385
	1981	16,799	1,127	17,926
	1982	25,760	1,123	26,883
	1983	13,205	528	13,733
	1984	20,086	1,084	21,170
All Facilities	1980	73,299	9,845	83,144
	1981	95,047	17,531	112,578
	1982	105,871	11,818	117,689
	1983	69,250	4,215	73,465
	1984	65,814	8,880	74,694

Table 16.--Release, catch and return statistics for 1978-brood fall chinook by facility and tag code

Rearing Facility	Tag Code	Number released	Catch	Return	Catch/ 1,000 releases	Percent Survival
Big Creek	7-18-44	224,900	593	205	2.6	.4
Bonneville	7-18-42	287,900	823	307	2.9	.4
	7-18-43	15,100	4	4	0.3	.1
Klaskanine	7-18-45	244,100	298	14	1.2	.1
Stayton Pond	7-18-41	283,800	1,849	254	6.5	.7
Sea Resources	63-19-18	24,200	24	0	1.0	.1
Abernathy	S-4-50	63,400	293	80	4.6	.6
	5-4-51	48,900	178	54	3.6	.5
Big White Pond	5-4-43	141,400	268	108	1.9	.3
Little White Salmon	5-4-48	177,800	31	13	.2	.0
	5-4-49	264,800	36	10	.1	.0
Spring Creek	5-4-33	140,900	1,418	248	10.1	1.2
	5-4-44	135,500	2,175	363	16.1	1.9
	5-4-45	55,600	2	1	.0	.0
	5-4-46	246,000	1,194	191	4.9	.6
Cowlitz	63-19-42	143,600	236	118	1.6	.3
	63-19-51	11,100	67	26	6.0	.8
Elokomin	63-18-56	21,100	10	1	.5	.0
	63-19-56	117,800	10	1	.1	.0
Grays River	63-16-46	73,900	30	11	.4	.0
	63-18-33	7,600	4	2	.5	.1
	63-19-37	68,100	28	8	.4	.1
Kalama Falls	63-19-57	214,500	77	65	.4	.0
Klickitat	63-19-49	225,400	241	0	1.1	.1
Priest Rapids	63-18-21	48,100	144	168	3.0	.7
	63-18-57	17,500	9	11	.5	.1
	63-19-58	5,300	6	1	1.1	.1
	63-20-17	82,200	33	18	.4	.0

Table 16 (Continued)

Rearing Facility	Tag Code	Number released	Catch	Return	Catch/ 1,000 releases	Percent survival
Speelyai	63-19-20	51,700	122	40	2.4	.3
	63-19-50	104,500	176	71	1.7	.2
Toutle	63-18-54	12,000	8	3	.9	.1
	63-19-41	132,100	115	49	.8	.1
Washougal	63-19-38	97,400	69	26	.7	.1
	63-19-46	154,500	122	72	.8	.1
Weyco Pond	63-19-39	92,400	61	9	.7	.1
TOTAL		4,035,100	10,754	2,552	2.7	.3

Table 17.--Release, catch and return statistics for 1979-brood fall chinook by facility and tag code

Rearing Facility	Tag Code	Number Released	Catch	Return	Catch/ 1,000 releases	Percent survival
Big Creek	7-21-60	143,400	1,204	289	8.4	1 .0
Bonneville	7-21-57	121,100	137	31	1.1	.1
Klaskanine	7-21-61	66,300	98	2	1.5	.2
OxBow	7-21-62	49,400	54	8	1.1	.1
	7-21-63	51,900	95	14	1.8	.2
Stayton Pond	7-20-55	282,000	1,891	187	6.7	.7
Sea Resources	63-20-61	18,400	40	23	2.2	.3
Abernathy	5-6-44	35,200	179	45	5.1	.6
	6-6-46	112,500	507	169	4.5	.6
Little White Salmon	5-6-43	162,600	46	2	.3	.0
Spring Creek	5-6-39	125,500	1,130	207	9.0	1.1
	5-6-40	75,200	1,230	200	16.4	1.9
	5-6-41	60,500	1,185	137	19.6	2.2
	5-6-42	23,100	94	15	4.1	.5
Cowlitz	63-21-37	20,700	158	64	7.6	1.1
	63-21-54	244,300	204	67	.8	.1
	63-21-59	70,500	53	26	.8	.1
Elokomin	63-20-S	98,400	61	13	.6	.1
Grays River	63-20-43	37,500	60	10	1.6	.2
Kalama Falls	63-21-5	100,400	165	89	1.6	.3
Klickitat	63-l 9-47	156,100	247	10	1.6	.2
Lewis River	63-21-60	103,700	280	68	2.7	.3
Lower Kalama	63-20-6	144,500	151	50	1.0	.1
Priest Rapids	63-19-48	147,200	384	232	2.6	.4
Washougal	63-21-53	314,600	619	262	2.0	.3
Weyco Pond	H1-2-3	97,800	64	32	.7	.1
TOTAL		2,864,700	10,336	2,2523	3.6	.4

Catches of wire tagged fish from this study have occurred in all Pacific Coast fisheries from California through Alaska. The fractions of 1978-brood tagged chinook salmon recovered in each fishery are .01, .41, .34, .07, .0, and . 17 for the Alaska, Canadian, Washington, Oregon, California, and Columbia River fisheries respectively. The fractions of the 1979-brood fish recovered are .03, .36, .36, .06, .01, and .19 for the same fisheries respectively. The proportion of the catch in the Washington fisheries will likely increase particularly for the 1979 brood of fall chinook since 1983 and 1984 Washington catches are not yet available.

The proportions of the ages of chinook caught differ among the hatcheries, but there are general trends by agency (Table 18). Catches of three-year-old chinook predominate for USFWS and ODFW hatcheries. For the 1978 brood the three-year-old chinook account for 77% of the catch from USFWS hatcheries and 70% of the catch from ODFW hatcheries. For the 1979 brood the three-year-old chinook account for 79% of the catch from USFWS hatcheries and 81% from ODFW hatcheries. The percentages of three-year-old chinook caught for the 1979 brood could decrease slightly when the four- and five-year old catches of chinook become available for the 1983 and 1984 Washington fisheries.

For the WDF hatcheries, the catch of four-year-old chinook predominate. For the 1978 brood, the three-year-old and four-year-old chinook account for 36 and 59% of the catch respectively. For the 1979 brood, the catch proportions are 53 and 40% for the same two age classes respectively. When the 1983 estimated recoveries in the Washington fisheries become available, I expect the catch proportion for 1979-brood four-year-olds to equal or exceed that for three-year-olds.

Hatchery returns show a trend similar to the catches but not quite so strong for USFWS and ODFW facilities (Table 18). Three-year-old returns predominate at USFWS facilities for both broods and ODFW facilities for the 1974 brood. However, for the 1978 brood at ODFW facilities a slightly larger proportion of four-year-old chinook returned than three-year-olds. For all three agencies, the proportion of four-year-old chinook in the return is larger than the proportion of this age group in the catch.

The brood year comparison described in Vreeland (1984)[1] has become even stronger. The overall catches/1000 releases for the 1978 and 1979 broods are 2 .7 and 3.6 fish respectively, (Table 16 and 17). When data for all fisheries are complete through 1984, the catch/1000 will equal or exceed 3.7 fish for the 1979 brood. There is too much incomplete data to speculate about the contribution of the 1980 and 1981 broods. The hatchery returns of tagged 1980-brood fish indicate a lower survival than for the 1978-brood fall

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[1]Vreeland, R.R. 1974. Evaluation of the contribution of chinook salmon reared at Columbia River hatcheries to the Pacific salmon fisheries. Nat. Mar. Fish. Serv., 847 NE 19th Ave., Suite 350, Portland, OR 97232. Unpubl. Manu. 85 p.

Table 18.--Age proportions of catches and returns of coded wire tagged fall chinook for USFWS, ODFW, and WDF facilities, 1978 and 1979 broods.

	Catch[1/]						Return					
	USFWS		ODFW		WDF		USFWS		ODFW		WDF	
Age	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
2	.08	.18	.06	.10	.03	.03	.09	.22	.02	.02	.08	.07
3	.77	.79	.70	.81	.36	.53	.62	.66	.46	.70	.23	.39
4	.14	.03	.23	.09	.59	.40	.28	.12	.50	.28	.62	.47
5	0	0	.01	0	.03	.04	.01	0	.02	0	.07	.07

1/ 1981 Alaska and 1983 Washington fisheries missing from 1978-brood and 1979-brood data and only preliminary data available for Alaska and British Columbia for 1984. Other 1984 data not yet available.

chinook. Yet catches of tagged 2- and 3-year-old fall chinook from the 1980 brood exceed the catches of these two age groups for the 1978 brood.

Comparisons of hatchery contributions and survivals among hatcheries are similar to that previously reported (Vreeland 1984) . In almost all cases, hatchery contributions and survivals for the 1979 brood equaled or exceeded those for the 1978 brood. The two cases where this is not true are Bonneville Hatchery and one release group at Priest Rapids Hatchery.

At Bonneville Hatchery, the fall chinook are reared in two different water sources, constant temperature well water and fluctuating colder Tanner Creek water. The well water reared fish reach a 70 to 80 fish per pound release size 3 to 4 weeks before the creek water reared chinook. The well water reared fish are released in early May and the creek water fish in late May. The well and creek water reared fall chinook were both represented by the same tag code for the 1978 brood. Disease prevented tagging of the 1979-brood chinook reared in well water. Thus only the creek water reared fish were represented by a tag code.

The contribution per 1,000 releases for the 1978-brood fish from Bonneville Hatchery is nearly three times that of the 1979 brood. The release of 1979-brood fish reared in creek water occurred after the eruption of Mt. St. Helens; May 20, 27 and 28, 1980. These fish had to migrate through the turbid water in the lower Columbia River. One could speculate the creek water reared chinook have a lower survival than well water reared fish and/or the migration of the 1979-brood fish through the turbid water of the lower Columbia River had a significant negative impact on the survival of these fish.

The 1978-brood release from Priest Rapids Hatchery consisted of four different tag codes. One of these codes, 63-18-21, has a higher contribution than the other three (3.0 vs 1.1, .5 and .4 fish/1000 releases). The fish containing the 63-18-21 code were release in late May at a size of 74 fish per pound. The other three groups of 1978-brood fall chinook were release in late June at the same size. The June releases were treated with salt in the water supply to eliminate an outbreak of Ichthyophtheres a week before the release. Released of 1979-brood fall chinook from Priest Rapids were again made in late May and June. However all release groups contained the same tag code and the contribution per 1000 releases is 2.6 fish. No disease treatment was needed prior to release of the 1979 brood. It is possible the earlier release of 1979-brood fish had a higher contribution than the later release as was the case for the 1978 brood. However the averaging of the three releases because

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[2]Vreeland, R.R. 1974, Evaluation of the contribution of chinook salmon reared at Columbia River hatcheries to the Pacific salmon fisheries. Nat. Mar. Fish. Serv., 847 NE 19th Ave., Suite 350, Portland, OR 97232. Unpubl. Manu. 85 p.

of a single tag code masks the possible advantage of the May release. There is evidence from other facilities indicating releases of fall chinook prior to June 1 have a higher survival than those made later.

During both brood years (1978 and 1979) fall chinook from Spring Creek Hatchery have the highest fishery contribution and survival. The Spring Creek contribution is followed by Stayton pond, Abernathy, Bonneville and Big Creek facilities respectively for the 1978 brood and Big Creek, Stayton pond and Abernathy facilities respectively for the 1979 brood.

Spring Creek Hatchery had four different release times and sizes for each brood. Each release contained a separate tag code. The contribution and survival of the four releases differ for each release. For the 1978 brood, the April release has the highest contribution and survival (16.1 fish/1000 releases and 1.9% respectively) followed by the May release (10.1 and 1.2%), the March release (4.9 and 0.6%) and the August release (0.0 and 0.0). For the 1979 brood, the Nay release has the highest contribution and survival (19.6 and 2.2%) followed by the April release (16.4 and 1.9%), the March release (9.0 and 1.1%) and the August release (4.1 and 0.5%). There seems to be no reason in the hatchery for the higher contribution and survival of the 1979 brood over the 1978 brood or for the difference among releases. Hatchery records indicate there were more disease problems during the rearing of the 1979 brood than the 1978 brood. During the rearing of both broods, the later the release, the greater the disease problems. The March and April releases suffered the same disease problems during the rearing of both broods. Disease increased for the May release and again for the August release. It appears in the case of Spring Creek releases, contribution and survival are dependent on factors external to the hatchery. The time and size of the releases likely contributed to the impact of the external factors.

There is a dramatic difference between brood year contributions at Big Creek. The catch per 1,000 releases at Big Creek are 2.6 for the 1978 brood and 8.4 for the 1979 brood. Both broods were released at a similar size, 81 fish per pound and 78 fish per pond for the 1978 and 1979 broods respectively. The fish were also released about the same time of year May 21, 1979 for the 1978 brood and May 13, 1980 for the 1979 brood. Minor disease problems were recorded for the 1978-brood fish but no treatment was deemed necessary. No disease problems were recorded for the 1979 brood. Similar total numbers of fish were released both years, 5.2 and 6.4 million for the 1978 and 1979 broods respectively.

One difference between broods is the 1979-brood fish were released five days prior to the eruption of Mt. St. Helens in 1980. Six million fish could not have held in Big Creek and migrated when the Columbia River cleared. Thus the fish must have been in the Columbia River when the eruption occurred. One would speculate the turbid water in the lower Columbia after the eruption would be a detriment to the health and survival of these fish. Thus one might expect the Big Creek fish to migrate into the clearer water of adjacent streams or be forced out to sea. From examination of Appendix Tables 5 through 13, it can be seen returns of Big Creek fall chinook have a tendency to stray to adjacent streams. The magnitude of the straying does not appear

to be different among the four broods released from the hatchery. It appears a majority of the fish were forced or quickly voluntarily migrated to sea.

Catches of Big Creek fish occurred in Canadian, Washington and Oregon marine and in the Columbia River fisheries. Increased catches of 1979-brood fish occurred in all of these fisheries as jacks and adults. The reason for the vast difference between the contribution of the two broods is not clear at this time.

In general for both brood years, the hatcheries which release fish prior to June at a size larger than 100 fish per pound have the highest survival. Hatcheries releasing after the end of May have a lower survival no matter what sizes of fish are released. However, there are several exceptions to these general trends. The March releases from Spring Creek have been smaller than 100 fish/pound. Although the contribution and survival of the March releases are lower than Spring Creek releases in April and May, the March release contributions are equivalent to the Abernathy releases in April and May. Releases from Big White Pond, Klaskanine, Klickitat and Sea Resources for the 1978 brood were made prior to June 1 at a size larger than 100 fish/pound. The best contribution rate and survival came from the Big White pond release (1.9 fish per 1000 releases and 0.3% survival). For the 1979 brood, Bonneville, OxBow, Klickitat, Priest Rapids and Sea Resources hatcheries made release prior to June 1 of fish larger than 100 fish/lb. The contribution and survival rates ranged from 2.6 fish/1000 release and 0.4% for Priest Rapids to 1.1. fish/1000 releases and 0.1% for Bonneville.

I believe rearing and release conditions are confounding factors at facilities where prior to June 1 releases resulted in low contribution and survival. The water supplies for Klaskanine and Sea Resources hatcheries are from lower river coastal streams. These systems are subject to extremes in water flow and turbidity. Water quality at both stations can be poor for extended periods during the winter. In addition rearing ponds at both stations were badly deteriorated. At Klaskanine concrete in pond floors and walls was cracked and broken. Fish were able to swim through the cracks from pond to pond and into the river. This problem was corrected at Klaskanine in 1983. The pond walls at Sea Resources are constructed of cinder blocks. The pond bottoms are dirt. Fish can swim under the walls and through the cracks in the morter. It is not difficult to see that rearing conditions at both these stations have been less than desirable. In addition both facilities are dependent on imported stocks each year.

Klickitat Hatchery has an excellent spring water supply of constant temperature. However fall chinook are reared in a dirt bottom pond for the last three months at the hatchery. This rearing environment led to a bacterial gill disease problem in April for both the 1978 and 1979 broods. The severity of the bacterial gill disease in the 1978 brood led to an emergency release in mid May 1979. This is likely a moot point for the tagged fish since they were never transferred to the dirt pond prior to the emergency release. They were held in a concrete raceway and released seven days after the fish in the dirt pond. However Klickitat hatchery is dependent on imported stocks and the releases are subjected to a 10°F drop in water temperature when entering the glacial fed Klickitat River. Also the

1979-brood fish had to migrate through the turbid water caused by the eruption of Mt. St. Helens.

The Big White Pond fish are Spring Creek stock. In March the fish are transported to two long concrete raceways on the Big White River. The raceways are supplied with river water of fluctuating temperature and turbidity. The 1978 brood was treated for ERM in March after transport and gill amoeba in early May.

The OxBow fish were reared for a time at OxBow hatchery in well water of constant temperature. The fish were transported to Herman Creek Pond for tagging in early May. The fish were again transported to a barge below McNary Dam at the time of release. The barge was towed below Bonneville Dam and the fish were released. The fish were Bonneville stock and no diseases were recorded during rearing. However, the fish obviously were subjected to considerable tagging and transport stress during the three weeks prior to release. The transportation prior to release may be a moot point considering all Stayton Pond fish are transported at release. However the OxBow fish had to migrate through the turbid water caused by the eruption of Mt. St. Helens.

The 1979-brood release from Bonneville Hatchery was discuss earlier. The tag code represented only the fish reared in Tanner Creek water with fluctuating temperature, and the fish had to migrate through the turbid water caused by the eruption of Mt. St. Helens.

As was mentioned previously the late May release of 1978-brood fall chinook from Priest Rapids had a higher contribution and survival than June releases. The 1979-brood May release had the same tag code as the June release so possible survival differences could not be examined.

One Cowlitz release is an exception to the lower survival of the after May release fish. A 1978-brood release represented by code 63-19-51 contributed 6 fish per 1,000 releases. This code represented a small group from two ponds at the hatchery. Releases were made in late June and mid October in 1979. The October release fish were 19 per pond and made up 70% of the release.

The influence of time and size of release on contribution and survival is confounded by other factors for both broods. In general WDF facilities have lower survival than other facilities. Hatchery records indicate disease problems could have influenced survival at many of the facilities having post May releases. The impact on the 1979 brood of the eruption of Mt. St. Helens and turbid lower Columbia River after May 18, 1980 is unknown. The bulk of the releases of 1979-brood fish from the four facilities (Spring Creek, Big Creek, Stayton Pond and Abernathy) with the highest survival occurred before May 18.

Summary of Expenditures

Expenditures for this project in FY85 were approximately $24,220. They are itemized in Table 19.

Table 19.-- Summary of Cost Estimates - FY85

Contractual Services:	
U.S. Fish and Wildlife Service	$18,100.00[1/]
University of Washington	1,000.00[1/]
Equipment (BPA portion of hard-disc drive/tape backup system).	5,000.00
Total Direct Costs	$24,100.00
Department of Commence Support (.5%)	120.50[1/]
Total	$24,220.50[1/]

1/ Total costs may prove less when final vouchers are received.

Appendix Table 1.--Returns in 1980 to Columbia River facilities and adjacent streams of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing facility	Tag code	Number of returns	Return site
Spring Creek	5-4-46	16	Spring Creek Hatchery
		2	Bonneville Hatchery
	5-4-44	32	Spring Creek Hatchery
		2	Bonneville Hatchery
	5-4-33	25	Spring Creek Hatchery
		1	Bonneville Hatchery
	5-4-45	1	Bonneville Hatchery
Big White Pond	5-4-43	5	Spring Creek Hatchery
		1	Bonneville Hatchery
Abernathy	5-4-50	2	Abernathy Hatchery
		1[6]	Abernathy Creek
	5-4-5 1	1	Abernathy Hatchery
Little White Salmon	5-4-48	1	Bonneville Hatchery
Bonneville	7-18-42	12	Bonneville Hatchery
Big Creek	7-18-44	3	Big Creek Hatchery
Stayton Pond	7-18-41	1	Willamette River
Grays River	63-16-46	1	Grays River Hatchery
Toutle	63-19-41	2[5]	Kalama Falls
Cowlitz	63-19-42	2[5]	Kalama Falls
		3[14]	North Fork Lewis R.
Kalama Falls	63-19-57	1	Kalama Falls
Speelyai	63-19-50	1[2]	Kalama Falls
		3[14]	N. Fork Lewis R.
Priest Rapids	63-18-21	2[l5]	Priest Rapids
		1	Wells Dam

Appendix Table 1 (Continued)

Rearing Facility	Tag code	Number of returns	Return site
Lewis River	63-18-13	1	N. Fork Lewis R.
	63-18-58	1	N. Fork Lewis R.
	63-19-2	1	N. Fork Lewis R.
	63-19-10	1	Kalama Falls
	63-20-10	2	N. Fork Lewis R.
	63-20-2	1	N. Fork Lewis R.

Appendix Table 2.--Returns in 1981 to Columbia River facilities and adjacent streams of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag code	Number of returns	Return site
Abernathy	5-4-50	25	Abernathy Hatchery
	"	2	Kalama Falls Hatchery
	"	1	Lower Kalama Hatchery
	"	2[8]	Kalama River
	"	5[12]	Abernathy Creek
	5-4-5 1	17	Abernathy Hatchery
	"	1	Lower Kalama Hatchery
	"	1	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
		4[9]	Abernathy Creek
Little White Salmon	5-4-48	3	Little White Salmon Hatchery
	"	2	Bonneville Hatchery
		1[4]	Big White Salmon River
	5-4-49	3	Little White Salmon Hatchery
		1	Spring Creek Hatchery
Spring Creek	5-4-46	87	Spring Creek Hatchery
	"	1	Abernathy Hatchery
	"	1	Little White Salmon Hatchery
		33	Bonneville Hatchery
	5-4-44	190	Spring Creek Hatchery
		52	Bonneville Hatchery
	5-4-33	137	Spring Creek Hatchery
	"	36	Bonneville Hatchery
	"	2[7]	Big White Salmon River
Big White Pond	5-4-43	12	Spring Creek Hatchery
	"	6	Little White Salmon Hatchery
	"	10	Bonneville Hatchery
Big Creek	7-18-44	41	Big Creek Hatchery
	"	2	Abernathy Hatchery
		3	Elokomin Hatchery
	"	1	Kalama Falls Hatchery
	"	2[5]	Abernathy Creek
	"	2[9]	Skamokowa Creek
	"	1	Gnat Creek

Appendix Table 2 (Continued)

Rearing Facility	Tag code	Number of returns	Return site
Bonneville	7-18-42	196	Bonneville Hatchery
		1	Spring Creek Hatchery
	7-18-43	3	Bonneville Hatchery
Klaskanine	7-18-45	3	Big Creek Hatchery
		1	Lewis & Clark River
Stayton Pond	7-18-41	75	Willamette Falls fish ladder
		18	Willamette River & tributar.
Grays River	63-16-46	1	Grays River Hatchery
		2	Big Creek Hatchery
	63-19-37	4	Grays River Hatchery
		1	Big Creek Hatchery
Cowlitz	63-19-42	24[25]	Cowlitz Hatchery
		1	Speelyai Hatchery
	63-19-51	8	Cowlitz Hatchery
Toutle	63-19-41	4	Cowlitz Hatchery
		1	Kalama Falls Hatchery
Kalama Falls	63-19-57	2	Kalama Falls Hatchery
Speelyai	63-19-20	1	Lower Kalama Hatchery
	"	1	Kalama Falls Hatchery
		1[9]	Lewis River
	63-19-50	2	Cowlitz Hatchery
		1	Kalama Falls Hatchery
Washougal	63-19-38	1	Washougal Hatchery
		1	Bonneville Hatchery
	63-19-46	7[8]	Washougal Hatchery
	"	1	Kalama Falls Hatchery
	"	3[16]	Washougal River
		1[9]	Lewis River

Appendix Table 2 (Continued)

Rearing Facility	Tag code	Number of returns	Return site
Priest Rapids	63-18-21	11[14]	Priest Rapids Hatchery
	"	2	Wells Dam
	"	2[36]	Priest Rapids area
	63-19-58	1	Priest Rapids Hatchery
	63-20-17	5[8]	Priest Rapids Hatchery

Appendix Table 3.--Returns in 1982 to Columbia River facilities and adjacent streams of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag code	Number of returns	Return site
Abernathy	5-4-50	7	Abernathy Hatchery
	"	5[15]	Abernathy Creek
		1[2]	Germany Creek
	5-4-51	10	Abernathy Hatchery
	"	1	Lower Kalama Hatchery
	"	3[9]	Abernathy Creek
		2[4]	Germany Creek
Big White Pond	5-4-43	9	Spring Creek Hatchery
	"	6	Little White Salmon Hatchery
	"	4	Bonneville Hatchery
		5[54]	Big White Salmon River
Little White Salmon	5-4-48	1	Little White Salmon Hatchery
		1	Bonneville Hatchery
	5-4-49	5	Little White Salmon Hatchery
Spring Creek	5-4-33	37	Spring Creek Hatchery
		5	Bonneville Hatchery
	5-4-44	78	Spring Creek Hatchery
		6	Bonneville Hatchery
	5-4-46	47	Spring Creek Hatchery
		2	Bonneville Hatchery
	"	1	Cascade Hatchery
Big Creek	7-18-44	68	Big Creek Hatchery
		1	Abernathy Hatchery
	"	17	Elokomin Hatchery
	"	1	Gnat Creek
	"	14	Big Creek
	"	21	Plympton Creek
	"	1[3]	Abernathy Creek
	"	2[5]	Skamokowa Creek
Bonneville	7-18-42	91	Bonneville Hatchery
		4	Cascade Hatchery
	7-18-43	1	Cascade Hatchery

Appendix Table 3 (Continued)

Rearing Facility	Tag code	Number of returns	Return site
Klaskanine	7-18-45	3	Klaskanine Hatchery
	"	3	Big Creek Hatchery
	"	3	Lewis & Clark River
Stayton Pond	7-18-41	137	Willamette Falls ladder
	"	1	Bonneville Hatchery
		18	Willamette River system
Cowlitz	63-19-42	57	Cowlitz Hatchery
	"	1[6]	Cowlitz River
		1[3]	Lewis River
	63-19-51	13	Cowlitz Hatchery
		1[3]	Lewis River
Elokomin	63-19-56	1	Elokomin Hatchery
Grays River	63-16-46	2	Grays River Hatchery
	"	1	Big Creek Hatchery
		1[2]	Skamokawa Creek
	63-18-33	2	Grays River Hatchery
	63-19-37	2	Grays River Hatchery
		1	Elokomin Hatchery
Kalama Falls	63-19-57	2	Kalama Falls Hatchery
	"	3	Lower Kalama Hatchery
	"	1	Lewis River Hatchery
	"	9[28]	Kalama River
	"	1[3]	Lewis River
		1[10]	Upper Columbia River
Priest Rapids	63-18-21	18[19]	Priest Rapids Hatchery
	"	1	Bonneville Hatchery
	"	8[77]	Priest Rapids area
	63-18-57	1	Priest Rapids Hatchery
		1[10]	Priest Rapids Area
	63-20-17	9	Priest Rapids Hatchery

Appendix Table 3 (Continued)

Rearing Facility	Tag code	Number of returns	Return Site
Speelyai	63-19-20	1	Cowlitz Hatchery
	"	2	Lower Kalama Hatchery
	"	1	Kalama Falls Hatchery
	"	1	Lewis River Hatchery
	"	7[22]	Lewis River
	63-19-50	2	Cowlitz Hatchery
	"	3	Lower Kalama Hatchery
	"	1	Lewis River Hatchery
	"	13[42]	Lewis River
Toutle	63-18-54	3	Cowlitz Hatchery
	63-19-41	12	Cowlitz Hatchery
	"	2	Lower Kalama Hatchery
	"	9	Kalama Falls Hatchery
	"	1	Lewis River Hatchery
	"	4[12]	Kalama River
Washougal	63-19-38	14	Washougal Hatchery
	"	2	Bonneville Hatchery
		1[4]	Lewis River
	63-19-46	22	Washougal Hatchery
	"	1	Lower Kalama Hatchery
	"	2[6]	Kalama River
		1[7]	Washougal River
Weyco Pond	63-19-39	2	Grays River Hatchery
	"	3	Big Creek Hatchery
	"	3	Elokomin Hatchery
		1	Clatskanie River

Appendix Table 4.--Returns in 1983 to Columbia River facilities and adjacent streams of 1978-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Numbers of returns	Return site
Big White Pond	5-4-43	1	Little White Salmon Hatchery
Little White Salmon	5-4-48	1	Little White Salmon Hatchery
	5-4-49	1	Little White Salmon Hatchery
Spring Creek	5-4-44	3	Spring Creek Hatchery
	5-4-46	1	Spring Creek Hatchery
Big Creek	7-18-44	4	Big Creek Hatchery
	"	5	Big Creek
		1	Skamokowa Creek
Bonneville	7-18-42	3	Bonneville Hatchery
Klaskanine	7-18-45	1	Bear Creek
Stayton Pond	7-18-41	4	Willamette Falls
Cowlitz	63-19-42	7	Cowlitz Hatchery
	63-19-51	2	Cowlitz Hatchery
Elokomin	63-18-56	1	Abernathy Hatchery
Grays River	63-16-46	1	Grays River Hatchery
		1	Elokomin Hatchery
Kalama Falls	63-19-57	13	Kalama Falls Hatchery
		2	Lewis River
Priest Rapids	63-18-21	1	Priest Rapids Hatchery
	"	1	Wells Hatchery
		2	Mid Columbia River
	63-20-17	1	Priest Rapids Hatchery
Speelyai	63-19-20	2	Lewis River
	63-19-50	3	Lewis River
		1	Cowlitz River
Toutle	63-19-41	3	Cowlitz Hatchery
Washougal	63-19-38	3	Washougal Hatchery
		1	Washougal River
	63-19-46	2	Washougal Hatchery

Appendix Table 5.--Returns in 1981 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-6-44	4	Abernathy Hatchery
	"	4[9]	Abernathy Creek
		1	Big Creek
	5-6-46	19	Abernathy Hatchery
	"	1	Spring Creek Hatchery
	"	6[14]	Abernathy Creek
Spring Creek	5-6-39	27	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	17	Bonneville Hatchery
	5-6-40	40	Spring Creek Hatchery
	"	6	Bonneville Hatchery
	5-6-41	28	Spring Creek Hatchery
	"	4	Bonneville Hatchery
Bonneville	7-21-57	3	Bonneville Hatchery
Big Creek	7-21-60	8	Big Creek Hatchery
OXBOW	7-21-62	2	Bonneville Hatchery
	7-21-63	1	Bonneville Hatchery
Cowlitz	63-21-54	2	Grays River Hatchery
	63-21-37	9	Cowlitz Hatchery
Klickitat	63-19-47	1	Little White Salmon Hatchery
Lewis River	63-21-60	1[9]	Lewis River
Priest Rapids	63-19-48	22[39]	Priest Rapids Hatchery
Sea Resources	63-20-61	3	Sea Resources Hatchery
Washougal	63-21-53	5	Washougal Hatchery

Appendix Table 6.--Returns in 1982 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-6-44	13	Abernathy Hatchery
	"	3	Lower Kalama Hatchery
	"	4[12]	Abernathy Creek
	5-6-46	41	Abernathy Hatchery
	"	2	Spring Creek Hatchery
	"	1	Big Creek Hatchery
	"	1	Bonneville Hatchery
	"	1	Lower Kalama hatchery
	"	22[64]	Abernathy Creek
	"	2[6]	Kalama River
	"	1[2]	Germany Creek
Little White Salmon	5-6-43	1	Little White Salmon Hatchery
Spring Creek	5-6-39	109	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	21	Bonneville Hatchery
	"	1	Cascade Hatchery
	"	1	Plympton Creek
		1[11]	Big White Salmon River
	5-6-40	95	Spring Creek Hatchery
	"	2	Little White Salmon Hatchery
	"	9	Bonneville Hatchery
	"	1	Cascade Hatchery
	"	2[22]	Big White Salmon River
	5-6-41	77	Spring Creek Hatchery
	"	3	Bonneville Hatchery
	"	2	Cascade Hatchery
	"	1[3]	Kalama River
	5-6-42	8	Spring Creek Hatchery
Big Creek	7-21-60	100	Big Creek Hatchery
	"	6	Abernathy Hatchery
	"	1	Bonneville Hatchery
	"	1	Willamette Falls
	"	18	Elokomin Hatchery
	"	19	Big Creek
	"	19	Plympton Creek
	"	4[9]	Skamokowa Creek
	"	2[6]	Abernathy Creek
	"	1[2]	Germany Creek

Appendix Table 6 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Bonneville	7-2 1-57	17	Bonneville Hatchery
Klaskanine	7-21-61	1	Elokomin Hatchery
		1	Big Creek
OxBow	7-21-62	1	Bonneville Hatchery
	7-21-63	6	Bonneville Hatchery
		1	Cascade Hatchery
Stayton Pond	7-20-55	155	Willamette Falls
		4	Willamette River
Cowlitz	63-2 l-37	20	Cowlitz Hatchery
	63-21-54	19	Cowlitz Hatchery
	"	1	Grays River Hatchery
	"	1[6]	Cowlitz River
	"	1[1]	Kalama River
	63-21-59	4	Cowlitz Hatchery
		1	Elokomin Hatchery
	11	1[6]	Cowlitz River
Elokomin	63-20-5	3	Elokomin Hatchery
		1	Big Creek Hatchery
Grays River	63-20-43	2	Grays River Hatchery
		3	Big Creek Hatchery
Kalama Falls	63-21-5	4	Kalama Falls Hatchery
	"	2	Lower Kalama Hatchery
	"	1	Cowlitz Hatchery
		2[6]	Kalama River
Klickitat	63-19-47	5	Klickitat Hatchery
		1	Sea Resources Hatchery
Lewis River	63-21-60	1	Lewis River Hatchery
	"	1	Lower Kalama Hatchery
	"	1[3]	Kalama River
		7[24]	Lewis River
Lower Kalama	63-20-6	3	Lower Kalama Hatchery
		1[3]	Kalama River

Appendix Table 6 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Priest Rapids	63-19-48	54[56]	Priest Rapids Hatchery
	"	1	Ringold Pond
	"	5[16]	Wells Dam
	"	1[3]	Lewis River
	"	4[38]	Priest Rapids area
Sea Resources	63-20-61	15[16]	Sea Resources Hatchery
Washougal	63-21-53	68[69]	Washougal Hatchery
	"	1	Bonneville Hatchery
	"	4	Cascade Hatchery
	"	4	Lower Kalama Hatchery
	"	1[3]	Lewis River
	"	2[6]	Kalama River
	"	4	Kalama Falls Hatchery
Weyco Pond	H1-2-3	12[13]	Grays River Hatchery
	"	7	Big Creek Hatchery
	"	3	Elokomin Hatchery
	"	1[2]	Skamokowa Creek

Appendix Table 7.--Returns in 1983 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-6-44	2	Abernathy Hatchery
	"	1	Abernathy Creek
	5-6-46	6	Abernathy Hatchery
	"	1	Spring Creek Hatchery
	"	3	Kalama Falls Hatchery
	"	6	Abernathy Creek
	"	1	Germany Creek
Little White Salmon	5-6-43	1	Little White Salmon Hatchery
Spring Creek	5-6-39	15	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	2	Bonneville Hatchery
	5-6-40	24	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-6-41	18	Spring Creek Hatchery
	"	1	Little White Salmon Hatchery
	"	1	Bonneville Hatchery
	5-6-42	7	Spring Creek Hatchery
Big Creek	7-21-60	36	Big Creek Hatchery
	"	2	Willamette Falls
	"	5	Bear Creek
	"	10	Big Creek
	"	10	Plympton Creek
	"	3	Abernathy Hatchery
	"	21	Elokomin Hatchery
	"	1	Lewis River
	"	2	Elochoman River
	"	7	Skamokowa Creek
	"	2	Abernathy Creek
Bonneville	7-21-57	10	Bonneville Hatchery
	"	1	Cascade Hatchery
OxBow	7-21-62	4	Bonneville Hatchery
	"	1	Cascade Hatchery

Appendix Table 7 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
OxBow	7-2 l-63	6	Bonneville Hatchery
Stayton Pond	7-20-55	28	Willamette Falls
Cowlitz	63-21-37	33	Cowlitz Hatchery
	63-21-54	17	Cowlitz Hatchery
	"	9	Elokomin Hatchery
	"	1	Lower Kalama Hatchery
	"	2	Kalama Falls Hatchery
	"	1	Lewis River Hatchery
	"	3	Cowlitz River
	"	3	Lewis River
	63-21-59	4	Cowlitz Hatchery
	"	3	Elokomin Hatchery
	"	2	Lower Kalama Hatchery
	"	3	Kalama Falls Hatchery
	"	1	Lewis River Hatchery
Elokomin	63-20-5	7	Elokomin Hatchery
		1	Elochoman River
Grays River	63-20-43	3	Grays River Hatchery
		1	Grays River
	"	1	Plympton Creek
Kalama Falls	63-21-5	58	Kalama Falls Hatchery
	"	7	Lower Kalama Hatchery
	"	1	Cowlitz River
	"	1	Kalama River
Klickitat	63-19-47	3	Klickitat Hatchery
Lewis River	63-21-60	3	Lewis River Hatchery
	"	2	Elokomin Hatchery
	"	2	Cowlitz Hatchery
	"	4	Kalama Falls Hatchery
	"	12	Lewis River
Lower Kalama	63-20-6	1	Lower Kalama Hatchery
	"	31	Kalama Falls Hatchery
	"	1	Cowlitz Hatchery
	"	1	Kalama River

Appendix Table 7 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Priest Rapids	63-19-48	52	Priest Rapids Hatchery
	"	1	Ringold Pond
	"	1	Wells Hatchery
	"	6	Mid Columbia River
Sea Resources	63-20-6 1	3	Sea Resources Hatchery
Washougal	63-21-53	129	Washougal Hatchery
		1	Lower Kalama Hatchery
		10	Kalama Falls Hatchery
		1	Lewis River Hatchery
		14	Washougal River
		2	Lewis River
Weyco Pond	Hl-2-3	4	Big Creek Hatchery
		1	Elokomin Hatchery
		1	Skamokowa Creek

Appendix Table 8.--Returns in 1984 to Columbia River facilities and adjacent streams of 1979-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return Site
Big Creek	7-21-60	1	Plympton Creek
Cowlitz	63-21-37	2	Cowlitz Hatchery
	63-21-54	1	Kalama Falls Hatchery
		1	Cowlitz River
	63-21-59	2	Cowlitz Hatchery
Elokomin	63-20-5	1	Elokomin Hatchery
Kalama Falls	63-21-5	5	Kalama Falls Hatchery
	"	1	Lower Kalama Hatchery
		3	Kalama River
Lewis River	63-21-60	1	Cowlitz Hatchery
		6	Lewis River
Lower Kalama	63-20-6	9	Kalama Falls Hatchery
		1	Kalama River
Priest Rapids	63-19-48	6	Priest Rapids Hatchery
	"	1	Bonneville Hatchery
	"	9	Bonneville Dam
		3	Mid-Columbia River
Sea Resources	63-20-61	1	Sea Resources Hatchery
Washougal	63-21-53	4	Washougal Hatchery
	"	3	Kalama Falls Hatchery
		2	Lower Kalama Hatchery
Weyco Pond	H1-2-3	1	Skamokowa Creek

Appendix Table 9.--Returns in 1482 to Columbia River facilities and adjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated returns in brackets)

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-7-44	14	Abernathy Hatchery
	"	3[9]	Abernathy Creek
	5-7-45	33	Abernathy Hatchery
	"	5	Lower Kalama Hatchery
	"	6[18]	Abernathy Creek
Little White Salmon [1/]	5-8-49	1	Spring Creek Hatchery
Spring Creek	5-7-40	1	Spring Creek Hatchery
	5-7-4 1	4	Spring Creek Hatchery
	5-7-46	1[5]	Columbia River
	5-7-52	1	Spring Creek Hatchery
Bonneville	7-2 l-56	12	Bonneville Hatchery
	7-23-29	6	Bonneville Hatchery
Big Creek	7-23-31	1	Big Creek Hatchery
	"	1[3]	Elochoman River
	7-23-33	4	Big Creek Hatchery
Clatsop County Ponds	7-21-59	1	Big Creek Hatchery
Stayton Pond	7-23-35	4	Willamette Falls
Cowlitz	63-21-56	25[26]	Cowlitz Hatchery
	"	1	Lewis River Hatchery
	63-22-55	4	Cowlitz Hatchery
Elokomin	63-22-34	1	Lower Kalama Hatchery
Grays River	63-22-63	1	Big Creek Hatchery
Klickitat	63-20-8	1	Klickitat Hatchery
Priest Rapids	63-21-55	9	Priest Rapids Hatchery

[1/] Fish returned in 1981.

Appendix Table 9 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Priest Rapids	63-22-61	1	Priest Rapids Hatchery
		2[129]	Priest Rapids area
Washougal	63-2 l-48	1	Washougal Hatchery
	63-22-51	1	Bonneville Hatchery
		1[3]	Kalama River
Weyco Pond	H1-3-1	1	Grays River Hatchery

Appendix Table 10.--Returns in 1983 to Columbia River facilities and adjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-7-44	13	Abernathy Hatchery
	"	1	Elokomin Hatchery
	"	2	Kalama Falls Hatchery
	"	5	Abernathy Creek
	5-7-45	63	Abernathy Hatchery
	"	1	Big Creek Hatchery
	"	2	Elokomin Hatchery
	"	1	Lower Kalama hatchery
	"	10	Kalama Falls Hatchery
	"	1	Washougal Hatchery
	"	1	Big Creek
	"	1	Kalama River
	"	1	Elochoman River
	"	3	Skamokowa Creek
	"	15	Abernathy Creek
Little White Salmon	5-7-47	2	Little White Salmon Hatchery
	"	1	Bonneville Hatchery
	5-8-49	1	Little White Salmon Hatchery
Spring Creek	5-7-40	13	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-7-41	22	Spring Creek Hatchery
	5-7-42	16	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-7-43	1	Spring Creek Hatchery
	5-7-46	5	Spring Creek Hatchery
	"	1	Icicle Creek
	5-7-48	1	Spring Creek Hatchery
	5-7-49	9	Spring Creek Hatchery
	"	1	Bonneville Hatchery
	5-7-50	3	Spring Creek Hatchery
	5-7-52	2	Spring Creek Hatchery

Appendix Table 10 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Big Creek	7-23-31	6	Big Creek Hatchery
	"	7	Elokomin Hatchery
	"	1	Big Creek
	"	1	Bear Creek
	"	1	Skamokowa Creek
	7-23-33	4	Big Creek Hatchery
	"	1	Abernathy Hatchery
	"	7	Elokomin Hatchery
	"	3	Bear Creek
	"	4	Big Creek
	"	1	Plympton Creek
	"	1	Abernathy Creek
	7-23-34	8	Big Creek Hatchery
	"	1	Elokomin Hatchery
	"	1	Bear Creek
	"	1	Elochoman River
	"	3	Skamokowa Creek
Bonneville	7-21-56	79	Bonneville Hatchery
	"	1	Cascade Hatchery
	"	1	Washougal Hatchery
	7-23-29	46	Bonneville Hatchery
		1	Spring Creek Hatchery
Clatsop County Pond	7-2 l-58	1	Grays River Hatchery
		3	lewis & Clark River
	7-21-59	1	Big Creek
		1	Lewis & Clark River
Klaskanine	7-22-27	2	Lewis & Clark River
	7-23-32	2	Lewis & Clark River
		1	Bear Creek
Stayton Pond	7-23-35	56	Willamette Falls
Cowlitz	63-21-56	90	Cowlitz Hatchery
		1	Lewis River Hatchery
		4	Willamette Falls
		2	Cowlitz River

Appendix Table 10 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Cowlitz	63-22-55	15	Cowlitz Hatchery
		1	Cowlitz River
Elokomin	63-22-34	5	Elokomin Hatchery
	"	1	Big Creek Hatchery
	"	1	Abernathy Hatchery
	63-23-17	2	Elokomin Hatchery
Grays River	63-22-63	2	Grays River Hatchery
Kalama Falls	63-20-36	16	Kalama Falls Hatchery
	"	1	Cowlitz Hatchery
	"	2	Lower Kalama Hatchery
	"	2	Kalama River
Lower Kalama	63-22-54	17	Lower Kalama Hatchery
	"	16	Kalama Falls Hatchery
		1	Cowlitz Hatchery
Priest Rapids	63-21-55	36	Priest Rapids Hatchery
	63-22-61	17	Priest Rapids Hatchery
Sea Resources	63-22-l	3	Sea Resources Hatchery
Washougal	63-21-48	19	Washougal Hatchery
		1	Washougal River
	63-22-5 1	39	Washougal Hatchery
	"	1	Bonneville Hatchery
	"	2	Lower Kalama Hatchery
	"	1	Kalama Falls Hatchery
	"	1	Kalama River
	"	1	Washougal River
Weyco Pond	H1-3-1	1	Big Creek Hatchery
		1	Grays River Hatchery
	Hl-3-2	1	Elokomin Hatchery

Appendix Table 11.--Returns in 1984 to Columbia River facilities and adjacent streams of 1980-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated return in brackets)

Rearing Site	Tag Code	Number of returns	Return Site
Abernathy	5-7-44	1	Abernathy Creek
	5-7-45	2	Abernathy Hatchery
		1	Elokomin Hatchery
Little White Salmon	5-7-47	5	Little White Salmon Hatchery
		1	Spring Creek Hatchery
	5-8-49	2	Little White Salmon Hatchery
Spring Creek	5-7-40	8	Spring Creek Hatchery
	5-7-41	11	Spring Creek Hatchery
	5-7-42	5	Spring Creek Hatchery
	5-7-49	3	Spring Creek Hatchery
		1	Bonneville Hatchery
	5-7-52	2	Spring Creek Hatchery
Bonneville	7-21-56	8	Bonneville Hatchery
	7-23-29	5	Bonneville Hatchery
Big Creek	7-23-31	1	Big Creek Hatchery
	"	1	Elokomin Hatchery
		3	Big Creek
	7-23-33	5	Big Creek Hatchery
	"	3	Elokomin Hatchery
	"	1	Bear Creek
	"	1	Big Creek
		2	Plympton Creek
	7-23-34	6	Big Creek Hatchery
	"	1	Elokomin Hatchery
	"	2	Bear Creek
		1	Big Creek
Clatsop County Pond	7-21-58	1	Elokomin Hatchery
	"	1	Lewis & Clark River
		1	Cowlitz River
	7-21-59	1	Big Creek Hatchery
		2	Big Creek

Appendix Table 11 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Clatsop Pond	7-21-59	1	Klaskanine River
		2	Lewis & Clark River
Klaskanine	7-22-27	1	Klaskanine River
	7-23-32	1	Big Creek Hatchery
Stayton Pond	7-23-35	28[60]	Willamette Falls Fishway
Cowlitz Hatchery	63-21-56	116	Cowlitz Hatchery
	"	1	Abernathy Hatchery
		11	Cowlitz River
Cowlitz	63-22-55	49	Cowlitz Hatchery
		11	Cowlitz River
Elokomin	63-22-34	8	Elokomin Hatchery
	"	1	Kalama Falls Hatchery
	"	2	Abernathy Hatchery
	"	4	Big Creek Hatchery
		1	Skamokowa Creek
	63-23-17	5	Elokomin Hatchery
Grays River	63-22-63	10	Grays River Hatchery
	"	2	Elokomin Hatchery
		1	Big Creek Hatchery
Kalama Falls	63-20-36	35	Kalama Falls Hatchery
	"	10	Lower Kalama Hatchery
	"	1	Cowlitz Hatchery
	"	4	Cowlitz River
	"	4	Kalama River
Lower Kalama	63-22-54	35	Lower Kalama Hatchery
	"	76	Kalama Falls Hatchery
	"	4	Cowlitz Hatchery
		11	Kalama River
Priest Rapids	63-21-55	64	Priest Rapids Hatchery
	"	6	Bonneville Dam
	"	2	Wells Dam
		3	Mid-Columbia River
	63-22-61	35	Priest Rapids Hatchery
	"	5	Bonneville Dam
		3	Mid-Columbia River

Appendix Table 11 (Continued)

Rearing Facility	Tag code	Number of returns	Return site
Sea Resources	63-22-l	2	Sea Resources Hatchery
Washougal	63-21-48	26	Washougal Hatchery
		2	Kalama Falls Hatchery
	63-22-5 1	44	Washougal Hatchery
	"	13	Kalama Falls Hatchery
	"	7	Lower Kalama Hatchery
	"	7	Washougal River
	"	3	Kalama River
	"	1[2]	Willamette Falls Fishway
		1	Sandy River
Weyco Pond	H1-3-1	1	Big Creek Hatchery
		1	Big Creek
	Hl-3-2	3	Elokomin Hatchery
		2	Skamokowa Creek

Appendix Table 12. --Returns in 1983 to Columbia River facilities and adjacent streams of 1981-brood fall chinook tagged for the BPA funded hatchery evaluation study

Rearing Facility	Tag Code	Number of returns	Return site
Abernathy	5-10-58	2	Abernathy Hatchery
		3	Abernathy Creek
	5-10-59	2	Abernathy Hatchery
		1	Abernathy Creek
Spring Creek	5-10-50	9	Spring Creek Hatchery
		3	Bonneville Hatchery
	5-10-51	1	Spring Creek Hatchery
		1	Bonneville Hatchery
	5-10-52	7[1/]	Spring Creek Hatchery
Big Creek	7-24-10	1	Big Creek Hatchery
		1	Skamokowa Creek
Bonneville	7-24-7	3	Bonneville Hatchery
Cowlitz	63-24-62	4	Cowlitz Hatchery
Lower Kalama	63-24-63	1	Lower Kalama Hatchery
Priest Rapids	63-22-52	4	Priest Rapids Hatchery
	63-24-56	2	Priest Rapids Hatchery
Sea Resources	63-24-57	1	Sea Resources Hatchery
Washougal	63-24-61	1	Washougal Hatchery

1/ One fish returned in 1982.

Appendix Table 13. --Returns in 1984 to Columbia River facilities and adjacent streams of 1981-brood fall chinook tagged for the BPA funded hatchery evaluation study (estimated return in brackets)

Rearing Facility	Tag Code	Number of returns	Return Site
Abernathy	5-10-58	18	Abernathy Hatchery
	"	1	Elokomin Hatchery
	"	2	Lower Kalama Hatchery
	"	2	Kalama Falls Hatchery
	"	1	Kalama River
	"	2	Abernathy Creek
	5-10-59	5	Abernathy Hatchery
	"	1	Big Creek Hatchery
	"	4	Abernathy Creek
Little White Salmon	5-4-35	1	Bonneville Hatchery
Spring Creek	5-10-50	34	Spring Creek Hatchery
	"	10	Bonneville Hatchery
	5-10-5 1	15	Spring Creek Hatchery
	"	3	Bonneville Hatchery
	5-10-52	41	Spring Creek Hatchery
	"	2	Bonneville Hatchery
	"	1	Cascade Hatchery
	5-10-57	1	Spring Creek Hatchery
Bonneville	7-24-7	69	Bonneville Hatchery
	"	1	Spring Creek Hatchery
	"	1	Cascade Hatchery
	7-24-8	7	Bonneville Hatchery
	7-26-63	1	Spring Creek Hatchery
Big Creek	7-24-10	56	Big Creek Hatchery
	"	1	Abernathy Hatchery
	"	11	Elokomin Hatchery
	"	4	Bear Creek
	"	9	Big Creek
	"	1	Plympton Creek
	"	4	Skamokowa Creek
Clatsop County Pond	7-24-12	2	Big Creek Hatchery
	7-24-13	1	Lewis & Clark River

Appendix Table 13 (Continued)

Rearing Facility	Tag Code	Number of returns	Return site
Klaskanine	7-24-9	1	Bear Creek
OxBow	7-23-30	1	Bonneville Hatchery
	7-24-11	1	Abernathy Hatchery
Stayton Pond	7-26-62	169[360]	Willamette Falls Fishway
Cowlitz	63-24-62	16	Cowlitz Hatchery
		8	Cowlitz River
Elokomin	63-22-60	1	Big Creek Hatchery
Grays River Hatchery	63-24-59		Big Creek Hatchery
Kalama Falls	63-24-60	3	Kalama Falls Hatchery
		1	Lower Kalama Hatchery
	"	1	Kalama River
Lower Kalama	63-24-63	5	Lower Kalama Hatchery
		2	Kalama Falls Hatchery
Priest Rapids	63-22-52	62	Priest Rapids Hatchery
		2	Mid-Columbia River
	63-24-56	24	Priest Rapids Hatchery
		1	Mid-Columbia River
Sea Resources	63-24-57	36	Sea Resources Hatchery
Washougal	63-24-61	7	Washougal Hatchery
Weyco Pond	H1-4-6	2	Big Creek Hatchery
		1	Skamokowa Creek

Appendix Table 14.--Returns of Fall Chinook to Columbia River facilities in 1980

Facility	Returns Female	Male	Jack	Total
Abernathy	336	274	130	740
Little White Salmon	1,126	433	114	1,673
Spring Creek	15,116	9,494	2,822	27,432
Big Creek	1,304	1,487	70	2,861
Bonneville	10,109	9,050	2,202	21,361
Cascade	1,010	743	104	1,857
Klaskanine	66	48	1	115
Willamette Falls			625	8,385
Cowlitz	1,046	922	221	2,189
Elokomin	645	429	0	1,074
Grays River	48	43	6	97
Kalama Falls[3/]	2,566	1,966	167	4,699
Kalama Falls[4/]			175	255
Klickitat	32	67	115	214
Lewis River	341	306	46	693
Lower Kalama	1,157	1,263	359	2,779
Priest Rapids	1,409	783	2,564	4,756
Sea Resources	59	64	3	126
Washougal	589	1,128	121	1,838
TOTAL	36,959	28,500	9,845	83,144

l/ Adults not sexed
2/ Includes 619 adults transported from Kalama Falls Hatchery
3/ Lower river production stock
4/ Upper river bright stock, adults not sexed

Appendix Table 15.--Returns of Fall Chinook to Columbia River facilities in 1981

Facility	Returns Female	Male	Jack	Total
Abernathy	454	828	743	2,025
Little White Salmon	767	474	256	1,497
Spring Creek	13,687	10,175	6,662	30,524
Big Creek	1,923	1,868	526	4,317
Bonneville	14,147	14,956	5,162	34,265
Cascade	131	103	15	249
Klaskanine	48	12	3	63
Willamette Falls	6,695	10,104	1,127	17,926
Cowlitz	2,750	1,947	976	5,673
Elokomin	349	284	1	634
Grays River	22	37	26	85
Kalama Falls[1/]	2,419	1,801	74	4,294
Kalama Falls[2/]	311	235	24	570
Klickitat	107	175	0	282
Lewis River	450	180	116	746
Lower Kalama	794	581	161	1,536
Priest Rapids	972	1,408	1,523	3,903
Sea Resources	130	67	32	229
Washougal	2,036	1,620	104	3,760
TOTAL	48,192	46,855	17,531	112,578

[1/] Lower river production stock
[2/] Upper river bright stock

Appendix Table 16.--Returns of fall Chinook to Columbia River facilities in 1982

Facility	Returns Female	Male	Jack	Total
Abernathy	1,032	1,033	1,016	3,081
Little White Salmon	1,337	710	101	2,148
Spring Creek	17,210	9,498	739	27,447
Big Creek	4,425	5,820	400	10,645
Bonneville	11,672	9,409	2,199	23,280
Cascade	450	364	76	890
Klaskanine	68	26	3	97
Willamette Falls	12,041	13,858	984	26,883
Cowlitz	2,618	2,149	1,023	5,790
Elokomin	889	1,167	6	2,062
Grays River	284	394	23	701
Kalama Falls	357	449	86	892
Kalama Falls	61	268	19	348
Klickitat	136	178	23	337
Lewis River	127	92	147	366
Lower Kalama	242	494	84	820
Lower Kalama	3	469	271	743
Priest Rapids	1,132	2,399	4,201	7,732
Ringold	65	112	14	191
Sea Resources			4	428
Washougal	1,271	1,277	260	2,808
TOTAL	55,420	50,166	11,679	117,689

1/ Lower river production stock
2/ Upper river bright stock
3/ Adults not sexed

Appendix Table 17.--Returns of fall chinook to Columbia River facilities in 1983

Facility	Returns Female	Male	Jack	Total
Abernathy	1,096	854	192	2,142
Little White Salmon	664	475	53	1,192
Spring Creek	5,889	3,514	1,005	10,408
Big Creek	2,158	1,754	75	3,987
Bonneville	6,319	6,497	585	13,401
Cascade [1/]	272	187	21	480
Cascade [2/]	736	532	87	1,355
Clatsop County Ponds			0	5 [3/]
Klaskanine	30	17	1	48
Willamette Falls	7,049	6,156	528	13,733
Cowlitz	2,646	3,654	147	6,447
Elokomin	1,419	1,271	1	2,691
Grays River	123	150	1	274
Kalama Falls [1/]	2,122	1,744	9	3,875
Kalama Falls [2/]	468	374	30	872
Klickitat	57	90	13	160
Lewis River [1/]	185	295	76	556
Lewis River [2/]	10	25	4	39
Lower Kalama [1/]	182	503	6	691
Lower Kalama [2/]	85	372	89	546
Priest Rapids	1,530	3,280	1,214	6,024
Ringold	89	87	28	204

1/ Lower river stock
2/ Upper river bright stock
3/ Adults not sexed

Appendix Table 17 (Continued)

Facility	Returns Female	Male	Jack	Total
Sea Resources	156	97	24	277
Washougal	1,775	2,257	26	4,058
TOTAL	35,060	34,185	4,215	73,465

Appendix Table 18. --Returns of fall chinook to Columbia River facilities in 1984.

Hatchery	Returns			
	Female	Male	Jack	Total
Abernathy	297	260	185	742
Big Creek	2,458	3,710	368	6,536
Bonneville	2,280	2,954	244	5,478
Cascade	102	55	4	161
Clatsop County Ponds			62	62
Cowlitz	2,942	2,898	169	6,009
Elokomin	722	932	10	1,714
Grays River	102	67	68	237
Kalama Falls	2,106 268	1,788 216	13	3,907 484
Klaskanine	26	15		41
Klickitat	46	92	2	140
Lewis River [2/]	78	81	195	354
Little White Salmon	407	153	17	577
Lower Kalama	705	643 1	30	1,378 1
Priest Rapids	3,130	4,523	5,581	13,234
Sea Resources	413	434	10	857
Spring Creek	5,273	3,424	799	9,496
Washougal	1,028	1,049	39	2,116
Willamette Falls	7,946	12,140	1,084	21,170
TOTAL	30,379	35,435	8,880	74,694

1/ Upriver bright fall chinook
2/ Includes Speelyai Hatchery

Appendix Table 19.-- Returns of fall chinook to Columbia River facilities as of September 30, 1985.

Hatchery	Returns			
	Female	Male	Jack	Total
Abernathy	944	1,015	243	2,202
Big Creek	4,016	6,449	268	10,733
Bonneville	3,786	4,800	88	8,674
Cascade	28	31	9	68
Clatsop County Ponds	18	28	0	46
Cowlitz	4,193		2,195	6,388
Elokomin	1,730		0	1,730
Grays River	180		76	256
Kalama FallS	2,514		177	2,691
	389		0	389 [1]/
Klaskanine	7	5	0	12
Klickitat	8		2	10
Lewis River [1/]	117		68	185
Little White Salmon	96	112	71	279
Lower Kalama	839		99	938
Priest Rapids	3,089		10,532	13,621
Sea Resources	115	87	0	202
Spring Creek	3,258	2,139	84	5,481
Washougal	557		363	920
Willamette Falls	29,285		1,112	30,397
	63,835		15,387	85,222

1/ Upriver bright fall chinook

1/ Includes Speelyai Hatchery